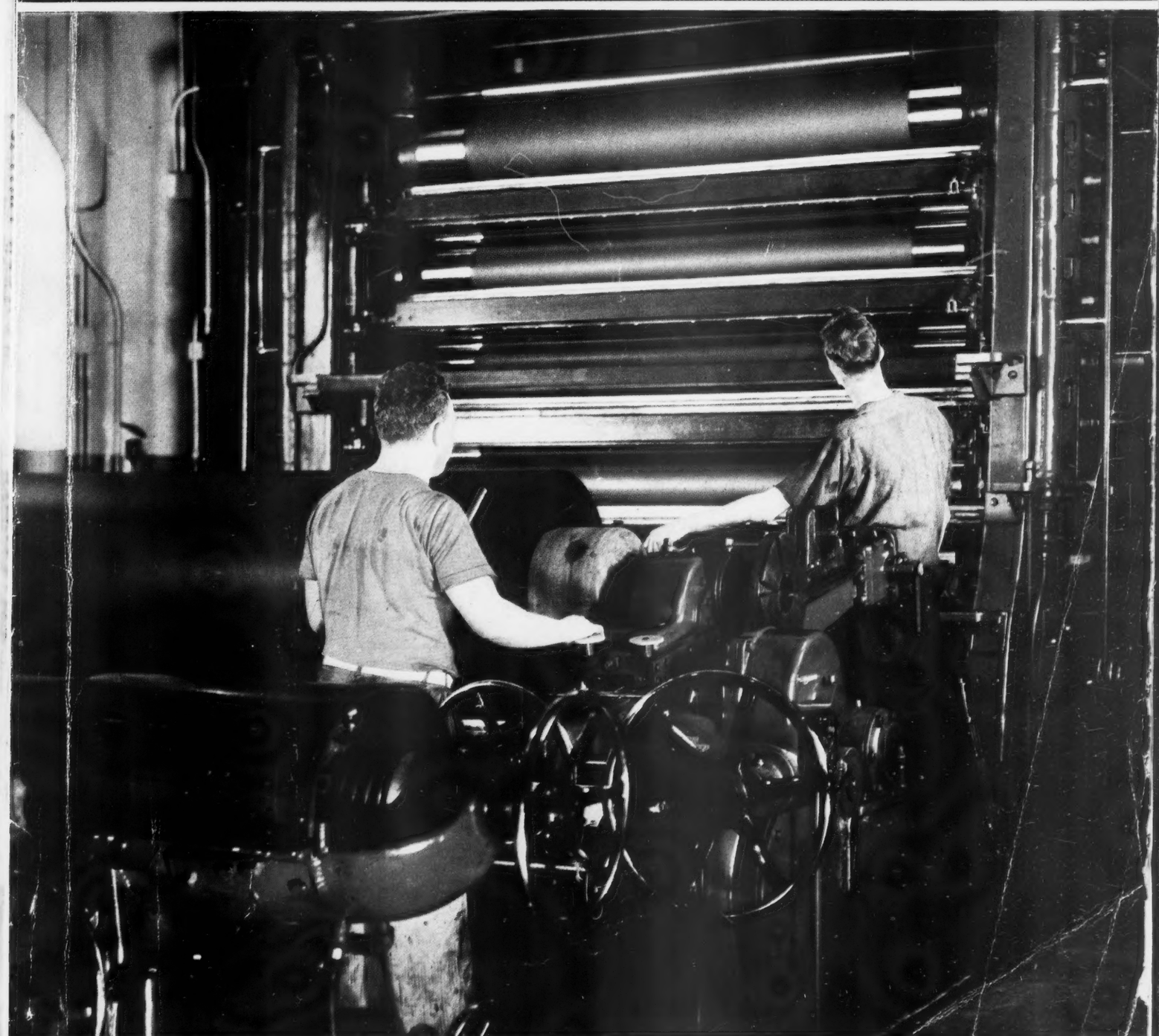
FEBRUARY, 1939

FACTORY

MANAGEMENT and MAINTENANCE

A McGRAW-HILL PUBLICATION



In this Issue: VANDENBERG AND OTHERS ON PROFIT SHARING

On a CIRCUIT BREAKER

THIS MARK ▸ I·T·E

IS YOUR SYMBOL OF

SAFETY

Illustrated is a Type LG circuit breaker, designed to carry 750 volts d-c, rated interrupting capacity 10,000 amperes.

Whether you are buying one circuit breaker or a complete switchboard, the ability of a circuit breaker unfailingly to perform its alloted task is your first consideration.

"I-T-E" has appeared on air-immersed circuit breakers for more than 50 years. It appeared on the first "air" breaker; it has identified the essential developments in the progress of the art.

"I-T-E," in terms of protection, means ample current-carrying capacity and the ability to interrupt fault-currents far beyond the assigned rating.

"I-T-E" stands for a rugged device, able to withstand shocks encountered in severe service. It stands for economy in maintenance.

A booklet, "Multumite Switchboards," describes all important features of I-T-E switchgear including details of the circuit breakers on which the performance of switchboards is basically dependent. May we send you a copy.

I·T·E 1939

FIFTY-FIRST YEAR

Offices in Principal Cities

IMMERSED IN AIR

I·T·E CIRCUIT BREAKER CO., PHILADELPHIA, PA.

"I call it rubber even if you say it's plasticized polyvinylchloride"

A typical example of Goodrich product development

IT'S an odd substance which most users say they'd rather call "synthetic rubber" even if Goodrich chemists, who developed it, *won't*. It's elastic; it can be molded to shape; but it's made from limestone, coke and salt, was never nearer a rubber tree than cold cream to a cow; and it has to do things that rubber won't do because it costs more.

A good covering for electric cable because it's practically fireproof; has a hundred industrial uses handling chemicals and greases; as a coating for cloth it makes the cloth waterproof and gives it resistance to sunlight.

Koroseal (we call it) is only one of four or more elastic synthetics used by Goodrich in various kinds of products which most of us call "rubber" products. Each of these has some characteristic that makes it best for some one or more purposes.

Synthetics are so important that Goodrich has a "synthetics department" to adapt various types to Goodrich products, to carry on research, to help Goodrich customers and prospective customers solve hundreds of problems. Men in this department not only *know* synthetics but they are creating new knowledge about them all the time. That's also Goodrich practice toward all industrial rubber products. It's the reason you are sure of the latest improvements and the greatest value if you specify GOODRICH to your distributor, whether you're interested in conveyor belts, rubber-lined tanks, hose—any mechanical goods of rubber or synthetics. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Goodrich

ALL *products problems* IN RUBBER

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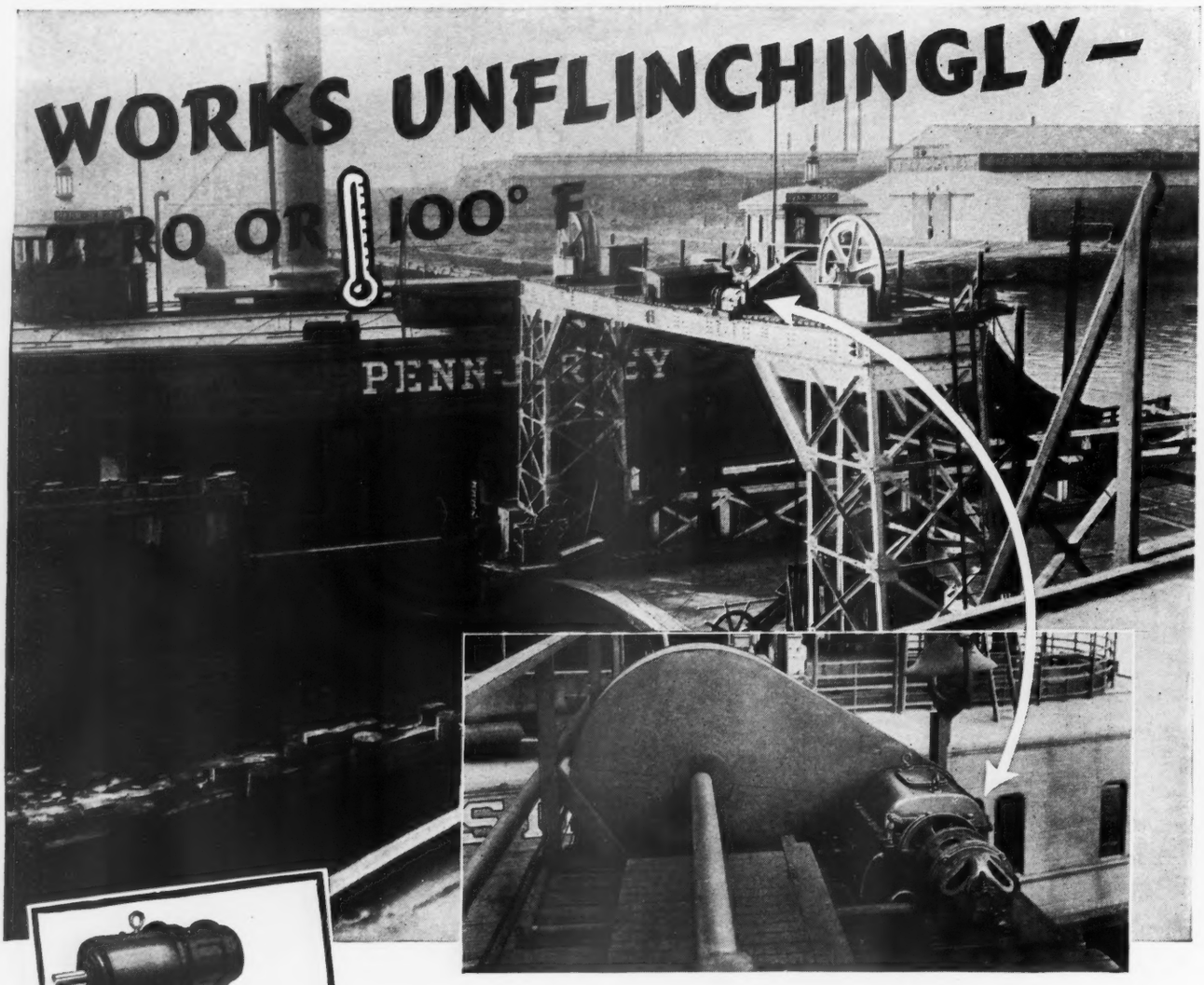


Motorized Helical Gear Reducer
Worm Gear Reducer
OTHER LINK-BELT POSITIVE DRIVES INCLUDE:
Silverlink Roller Chain Drive
Silverstreak Silent Chain Drive
P.I.V. Gear and V.R.D. Variable Speed Units

This Link-Belt Speed Reducer does a real job

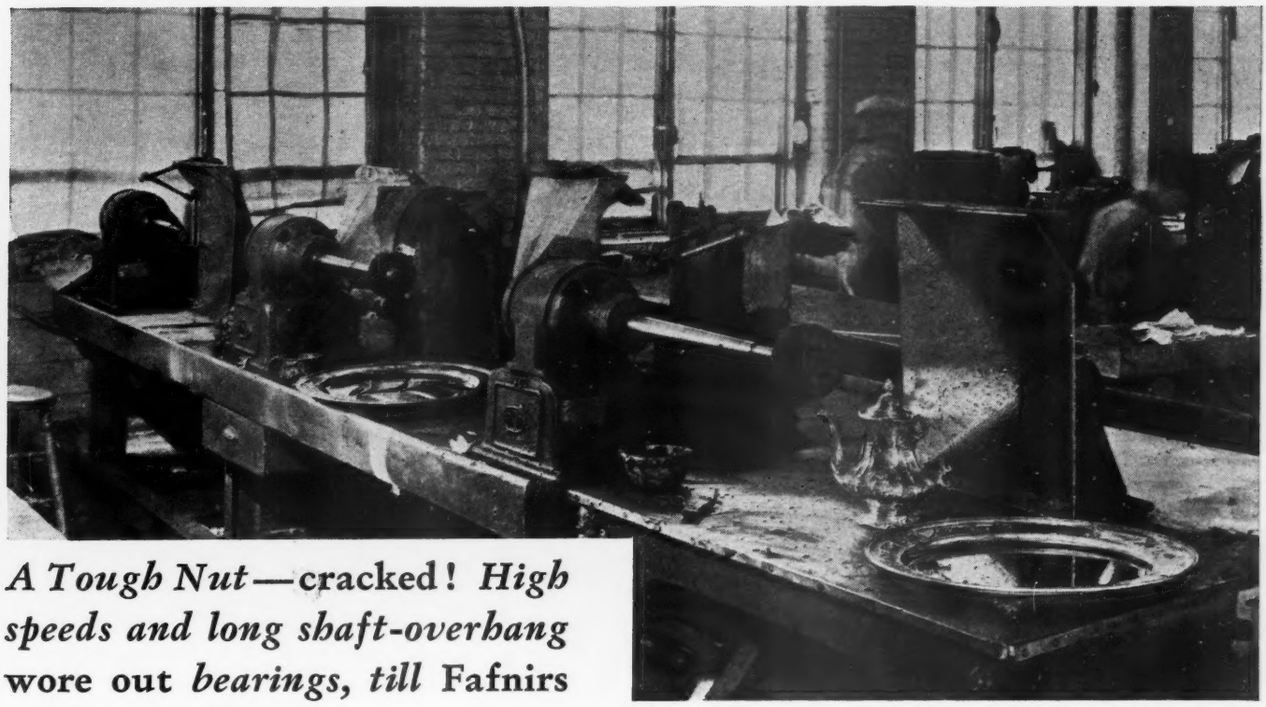
● Out in the open—operating day and night in all kinds of weather and exposed to temperature changes from 100° above to 20° below zero, F., this Link-Belt herringbone gear reducer transmits power to a drum hoist for raising and lowering the hinged water-end of a ferry bridge. It's a real test. But, don't worry, this reducer can "take it"! It was designed and built by Link-Belt to take punishment even worse than this, and to give years of reliable, trouble-free performance on any job.

Choose your next speed reducer from the Link-Belt line which includes herringbone gear, worm gear and motorized helical gear units in a variety of sizes, ratios and horse powers to meet practically any requirement. If it's dependability you want . . . specify LINK-BELT!

Send for catalogs on any or all of the Link-Belt positive drive units illustrated. Address: Link-Belt Company, Philadelphia, Chicago, Indianapolis, Atlanta, San Francisco, Toronto, or any of our other offices, located in principal cities. 7814

LINK-BELT
SPEED REDUCERS

GORHAM SLASHES BEARING REPLACEMENTS *by 97%!*



A Tough Nut*—cracked! *High speeds and long shaft-overhang* wore out *bearings, till* Fafnirs *took over the job . . . . .

3-STEP INSTALLATION SAVES TIME AND TROUBLE

1. Slip the shaft through the bearing unit.
2. Engage and turn the collar . . . the bearing is secured to the shaft.
3. Set the screw, to hold collar in locked position.

210 Polishing Heads in the plant of the Gorham Manufacturing Company required bearing replacements every year. Because the buffing units are operated at high speeds, with the tapered shafts of the polishing heads overhanging the motor housings by two feet, the problem was a particularly tough one.

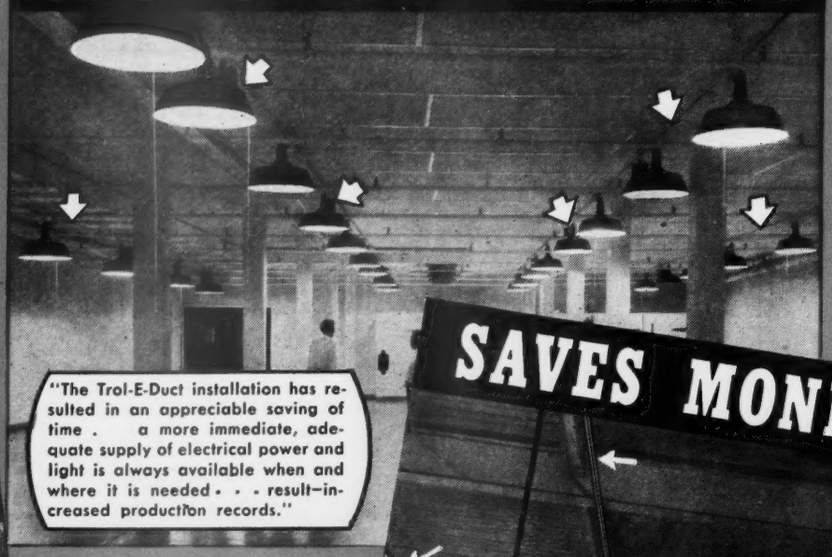
As a comparative test, half the worn-out bearings were replaced by Fafnirs . . . the others with another make. At the end of a year, replacement requirements had dropped from nearly 100% to less than 30%. This time, Fafnir replacements were used exclusively. When the records were again computed, the yearly replacements had dropped to only 3%—*and not one of the Fafnirs had yet required replacement!*

For cutting friction and stepping up efficiency in hundreds of applications, the correct Fafnir unit provides deep-groove, large-ball load capacity as well as *unequaled ease of installation.* The Fafnir Catalog is yours for the asking. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR *Ball Bearings*

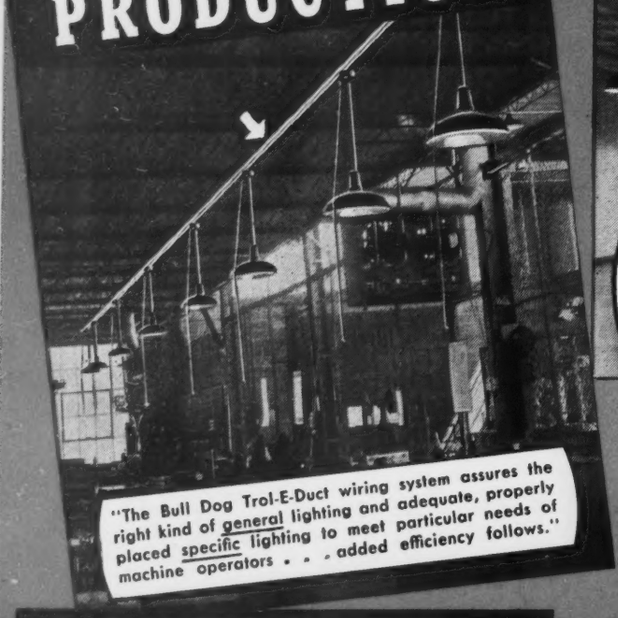
THE BALANCED LINE • MOST COMPLETE IN AMERICA

PROMOTES EFFICIENCY



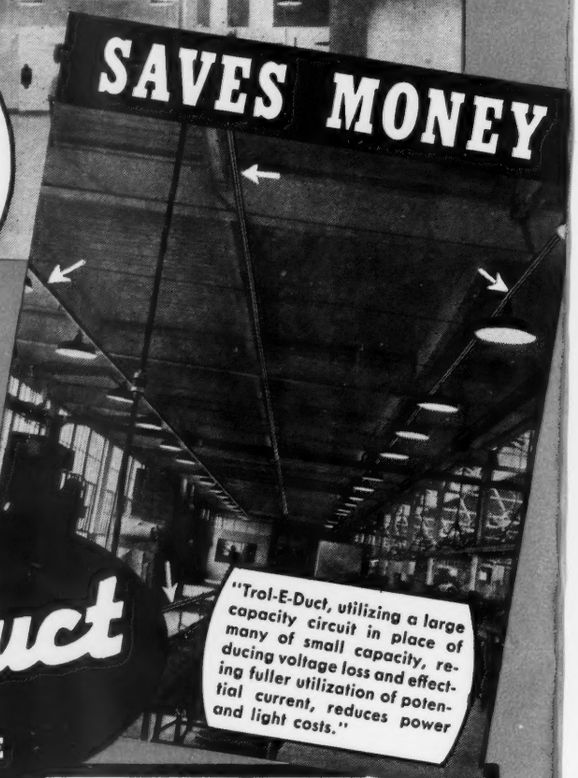
"The Trol-E-Duct installation has resulted in an appreciable saving of time . . a more immediate, adequate supply of electrical power and light is always available when and where it is needed . . . result—increased production records."

INCREASES PRODUCTION



"The Bull Dog Trol-E-Duct wiring system assures the right kind of general lighting and adequate, properly placed specific lighting to meet particular needs of machine operators . . . added efficiency follows."

SAVES MONEY



"Trol-E-Duct, utilizing a large capacity circuit in place of many of small capacity, reducing voltage loss and effecting fuller utilization of potential current, reduces power and light costs."

CONVENIENT

"Trol-E-Duct provides light where you want it . . . as quick as the wish for it . . . it is just as valuable in 5-foot installations over individual machines as in the complete plant installation."

The 5-foot Handy Set is a complete unit in itself, and installation can be made in a few minutes. It will pay back its low cost many times over permits you to test, for less than $4, the worth and efficiency of Trol-E-Duct as a source of lighting distribution before considering a larger system investment.

The Set includes a 5-foot Section of Duct, Feed-In End Cap, Trolley Entrance End Cap, Two Supporting Hangers, 5-foot Cord with Attachment Plug and Trolley.

List price HANDY SET with Receptacle Type Trolley, $4.00
With Terminal Type Trolley The Set is Priced at $3.75 list

BULL DOG Trol-E-Duct

A SYSTEM OF MOVABLE ELECTRICAL OUTLETS

The Modern **BUSWAY** Lighting System

Trol-E-Duct is modern . . . new! But . . . Trol-E-Duct has already achieved amazing successes for scores of plant owners who have installed this better Busway system of electrical distribution.

It is a FLEXIBLE system of movable outlets in contrast to the old fashioned limited system of fixed lighting outlets. It consists of bus bars in a slotted duct run—every inch of which is a potential electrical outlet. By the use of movable trolleys, or semi-fixed twist-out plugs, lights may be easily and quickly moved to any desired location.

For a convenient, flexible, economical Busway lighting system, investigate Bull Dog Universal Trol-E-Duct.

Write for Illustrated Bulletin Describing This Flexible BUSWAY Electrical Distribution System

TROL-E-DUCT IS DISTRIBUTED THROUGH LOCAL BULL DOG ELECTRICAL WHOLESALERS

ADEQUATE WIRING SERVES AND SAVES

BULL DOG ELECTRIC PRODUCTS COMPANY

Manufacturers of Vacu-Break Safety Switches, Panelboards, Switchboards, Duct Systems—FOR LIGHT AND POWER

DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO, ONT.

PIONEERS OF FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

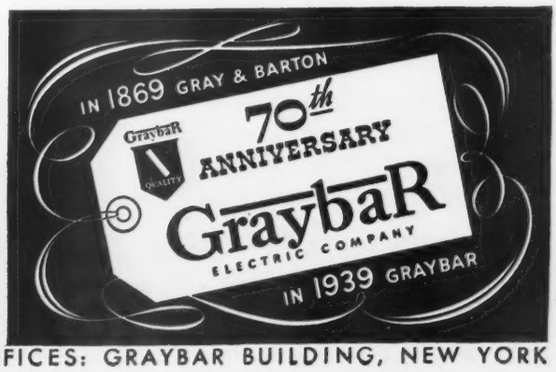
WHEELS OF INDUSTRY - 1869

SEVENTY years ago...when industry was emerging from the velocipede era . . . our service as a supplier of electrical products began.

Today Graybar serves American industry . . . and electrical contractors who serve industrials not having their own installation crew, as a convenient source of everything electrical for every factory need.

Today, too, factory executives are meeting the challenge of higher costs by installing more efficient equipment . . . by replanning and modernizing. They are finding in Graybar a well-stocked, nearby source of modern wiring and power equipment . . . of convenient unit ventilation . . . of better lighting . . . of time-saving signals . . . of *all* electrical supplies.

Graybar brings you what you want, when and where you want it . . . quickly . . . conveniently from a nearby warehouse. And Graybar backs every product with a 70 year Graybar reputation for dependability.



OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK

Bassick TRUCK CASTERS

The complete line . . . with sizes and types for every materials-handling requirement

Outstanding leadership in volume of business—resulting from leadership in

- **Engineering development**
- **Quality of product**
- **Economy in cost**
- **Economy in operation**

When you need truck casters or casters of any size, any type, for any purpose, think of *Bassick*—and let a conveniently located industrial distributor of Bassick Casters check your requirements. Factory representatives are also at your service. Ask for Bassick Catalog No. 120.

FOR FURTHER INFORMATION
SEE OUR CATALOG IN SWEET'S

THE BASSICK COMPANY · BRIDGEPORT, CONNECTICUT

Canadian Factory: STEWART-WARNER-ALEMITE CORPORATION, LTD., BELLEVILLE, ONTARIO

IT'S GOOD BUSINESS *to use good* BRUSHES

SPECIFY Osborn Brushes

(Reading time: 29 Seconds or less)

• Running at 3500 R.P.M., five days a week, the Osborn Wire Wheel Brushes illustrated are lasting *six times longer* than the brushes used formerly.

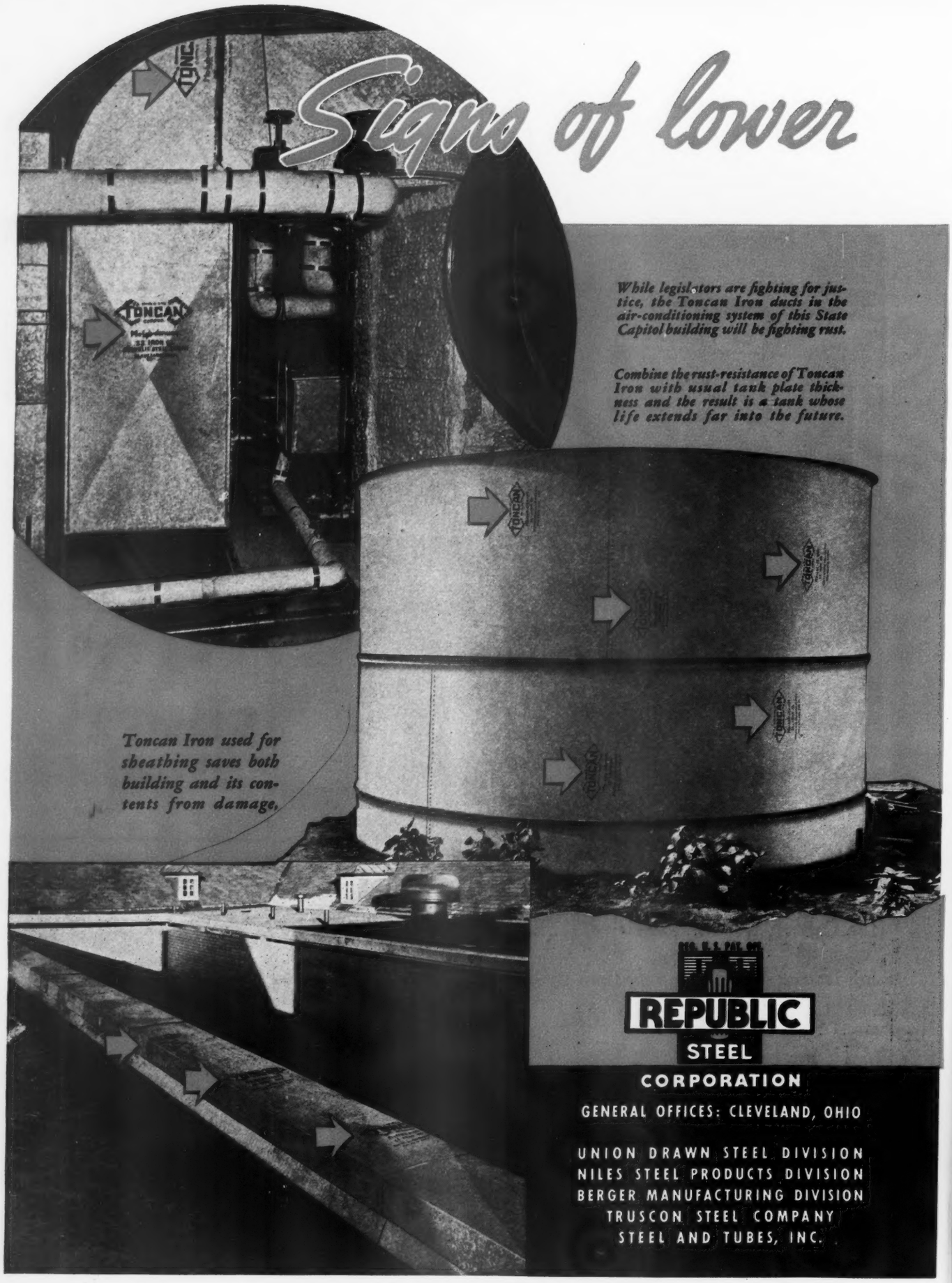
Add to the savings on brush costs, the greater savings in faster, better results on the operation, and it's easy to see WHY it's good business to use good brushes, *properly matched to job requirements.*

Osborn and the Osborn Distributor in your locality can help YOU gain the cost-saving advantages of Osborn Brushes. *Ask about it!*

OSBORN

THE OSBORN MANUFACTURING COMPANY • 5401 HAMILTON AVENUE • CLEVELAND, OHIO

Signs of lower



While legislators are fighting for justice, the Toncan Iron ducts in the air-conditioning system of this State Capitol building will be fighting rust.

Combine the rust-resistance of Toncan Iron with usual tank plate thickness and the result is a tank whose life extends far into the future.

Toncan Iron used for sheathing saves both building and its contents from damage.

REG. U.S. PAT. OFF.

REPUBLIC
STEEL
CORPORATION

GENERAL OFFICES: CLEVELAND, OHIO

UNION DRAWN STEEL DIVISION
NILES STEEL PRODUCTS DIVISION
BERGER MANUFACTURING DIVISION
TRUSCON STEEL COMPANY
STEEL AND TUBES, INC.

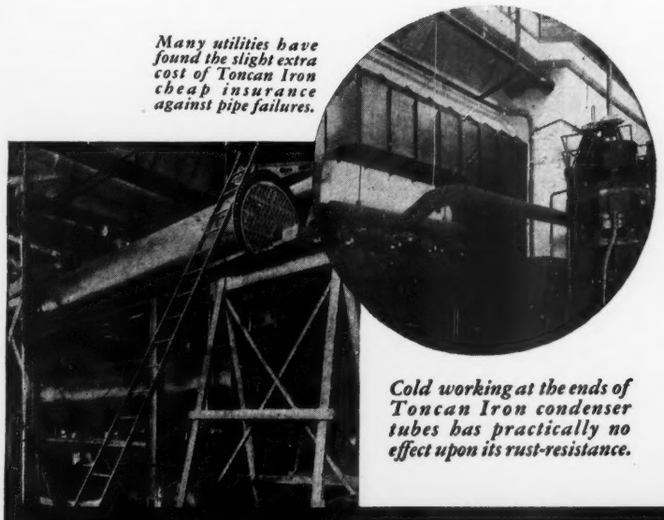
maintenance in 1949

● Lucky the men today in charge of plants where, ten or more years ago, Toncan Copper Molybdenum Iron was used. Lucky the man in 1949 who heeds *now* the warning finger of experience.

In sheets—plates—pipe—boiler tubes—on roofs—in tanks—in processing lines—or boilers—Toncan Iron fights a good fight against industry's greatest scourge, because its alloy content gives it the highest degree of rust-resistance of any ferrous metal in its price class.

For new equipment and for replacements, specify Toncan Iron. Deal maintenance costs a blow that will be remembered through the years.

For technical information write for literature on Toncan Iron.



Many utilities have found the slight extra cost of Toncan Iron cheap insurance against pipe failures.

Cold working at the ends of Toncan Iron condenser tubes has practically no effect upon its rust-resistance.

REG. U.S. PAT. OFF.

TONCAN

COPPER
MO·LYB·DEN·UM

IRON

TONCAN IRON IS AVAILABLE IN . . .

- Black and galvanized pipe.
- Black, galvannealed and galvanized sheets
- Plates
- Boiler tubes
- Condenser tubes
- Formed roofing products
- Conductor pipe
- Eaves trough
- Well tubing
- Culverts
- Bolts, nuts, rivets and welding rod

and is used by manufacturers of all types of equipment to insure customer good will on the products they make and sell.

TONCAN IRON

An alloy of refined open-hearth iron, copper and molybdenum
—that grows old slowly

YES! ONLY SOCONY

600-W

Plant men naturally seem to say "600-W," when they mean high-grade cylinder oil that allows minimum feed . . . assures unbroken Oil Film. We're proud of that—but want you to remember Gargoyle Cylinder Oil "600-W" is a Socony-Vacuum brand. It was the first oil of its type—the first petroleum oil used in steam engines—and the finest today.

WHAT THE Socony-Vacuum man wants to do is: *help increase your production profits!*

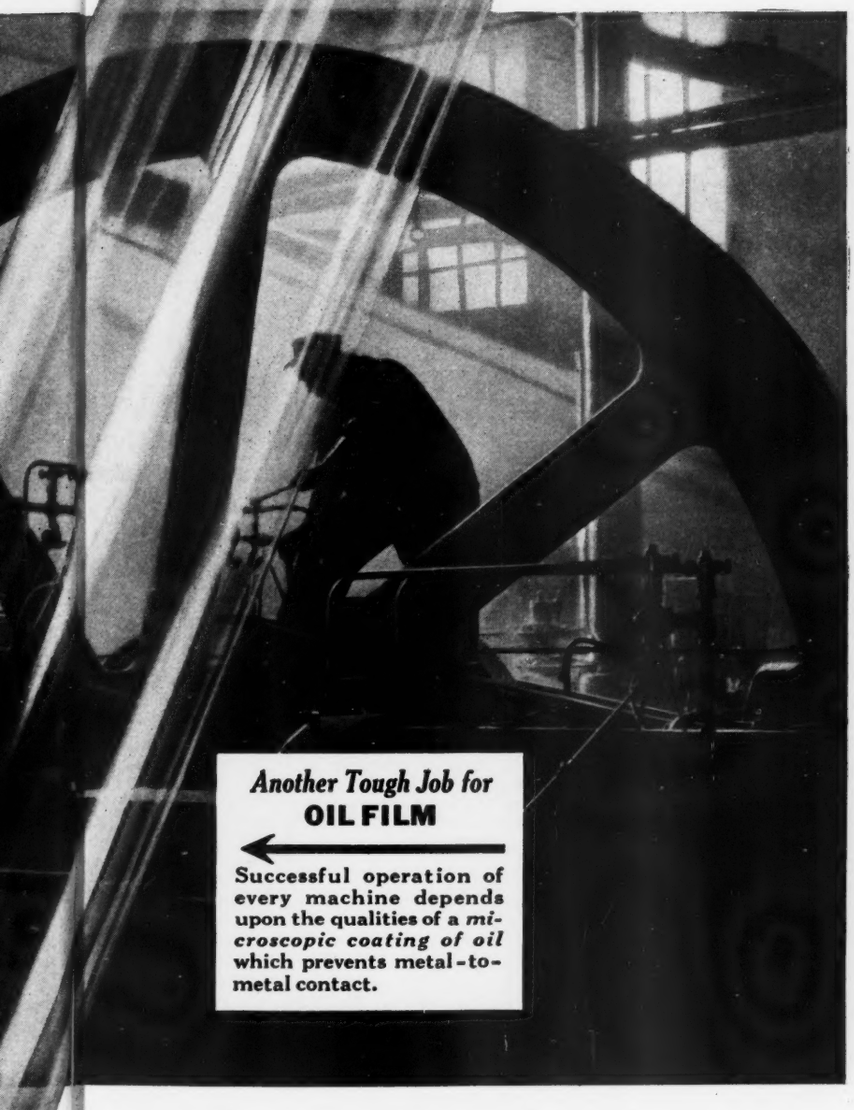
Here are his exclusive tools: The finest lubricants made. 73 years' experience...and thousands of case histories—to guide him in the use of lubricants exactly right for your machines. Close cooperation with machinery builders...and world-famous research laboratories—to develop new lubricants ahead of new needs.

Furthermore, world-wide distribution and uniformity make the same quality available everywhere.

Isn't that worth talking over with a Socony-Vacuum man? We believe you'll find it time well spent.

NY-VACUUM MAKES

W_THAT'S WORTH REMEMBERING


Another Tough Job for
OIL FILM
Successful operation of every machine depends upon the qualities of a *microscopic coating of oil* which prevents metal-to-metal contact.

SOCONY-VACUUM

Industrial Service and Lubricants Help to Lower Costs by

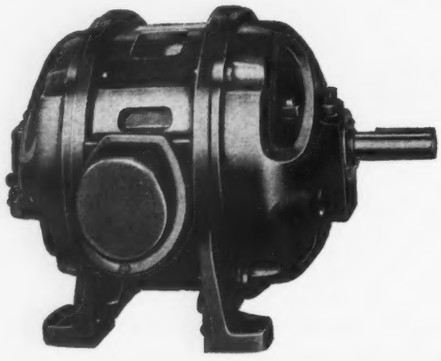
Correct Lubrication

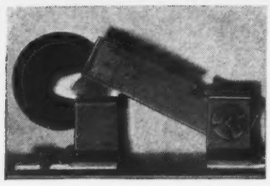
GARGOYLE Lubricants

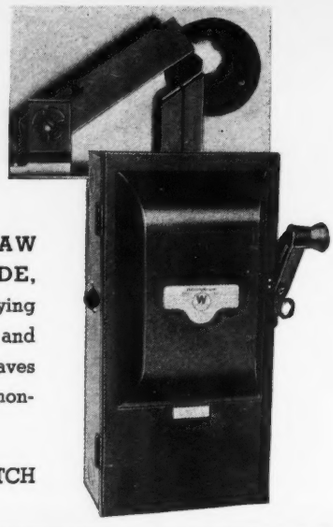
WESTINGHOUSE POINTS THE WAY

TO NEW SPEED IN PRODUCTION

EXTRA STRENGTH AT NO EXTRA COST IN WESTINGHOUSE MOTORS . . . Extra electric strength in Tufferneil Insulation, extra mechanical strength in rigid one piece frames. Ball or sleeve bearings free from lubrication grief.







DIAMOND POINTED JAW WITH EXTENDED BLADE, confines arc to noncurrent carrying areas . . . eliminates burning and beading. Saves dressing down, saves maintenance. Ask to see it demonstrated.

WESTINGHOUSE SAFETY SWITCH

HIGH SPEED MOTOR EFFICIENCY FOR SLOW SPEED MACHINES . . . Now you can get the horsepower you want at the rpm. of the driven machine. Saves cost of separate mechanical units . . . simplifies installation, saves maintenance of belts, pulleys, sprockets or chain.

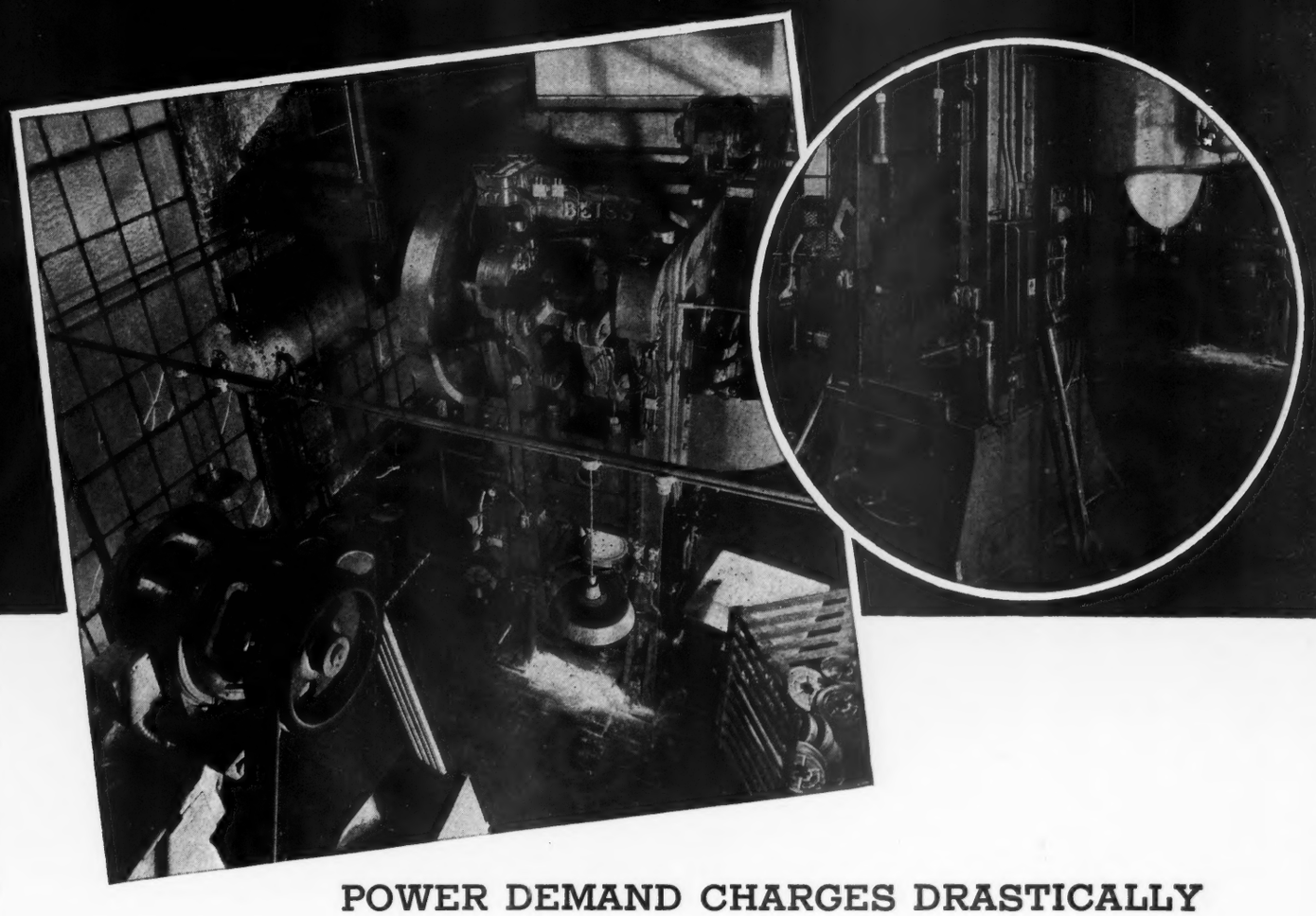
ALL NECESSARY CONTROL AND PROTECTION IN ONE EASILY INSTALLED PACKAGE. . . The Westinghouse Combination Linestarter . . . Costs less to install . . . saves wiring, conduit, labor . . . simplifies inspection.

★ ★ ★

WESTINGHOUSE COMBINATION LINESTARTER

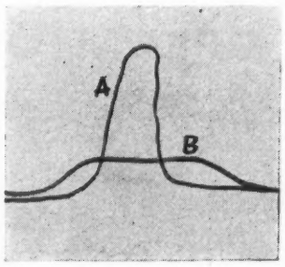
Westinghouse

W WESTINGHOUSE ELECTRIC



POWER DEMAND CHARGES DRASTICALLY CUT BY CORRECT MOTOR APPLICATION

A Westinghouse representative, making this little sketch on the scratch pad of a stove manufacturer's desk, showed him how to cut his demand charge for power in his punch press operations.



The "A" line in the sketch represents the peak load of a 25 hp. general purpose motor the buyer thought he required. The "B" line represents the power demand of a Westinghouse 15 hp. punch press motor, capable of operating the presses efficiently. Notice the saving.

Similarly, the Westinghouse representative showed how presses powered by 20 hp. motors could be better operated by 10 hp. punch press motors, and how 5 hp. presses could be operated by 3 hp. motors.

Change-overs are now partially made. When completed, savings in demand charges will be several hundred dollars a month—and these savings will accrue to the manufacturer for years to come.

In working out your own motor and control applications, consult Westinghouse. Be sure you have the advantage of modern developments in motors and control, and their efficient application. Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa.

Apparatus wholesalers, industrial agents, and district offices in all principal cities.

J-90150

Motors and Control

LET US HELP YOU INSTALL

GREEN LIGHTS

ALL DOWN THE LINE OF PRODUCTION . . .

FOR MORE EFFICIENT OPERATION, GREATER PROFIT

Your own problems are directly affected by the kind of safety service provided with your firm's workmen's compensation insurance. Some of the differences in service, between one insurance company and another, are described on this page. An example of results, reflected in dollars, is shown in the chart opposite.

NOT YOUR RESPONSIBILITY? BUT — ISN'T IT?

You may say you have nothing to do with insurance. But insurance *does* have something to do with you. The service American Mutual provides, helps to clear the road for production—preventing costly delays, spoiled work, loss through injury of valued workers. Employee relations are improved by your extra regard for workers' safety. And your firm gets a three-fold opportunity to increase profits. Certainly when insurance means *that*, it *is* your business.

SAFETY SERVICE, CUSTOM-BUILT FOR YOU

Each program worked out by American Mutual safety consultants, fits that particular firm's hazards, workers, supervisors, etc. Amount of service is gauged by what the firm can use profitably, without interruptions to production or unnecessary expense.

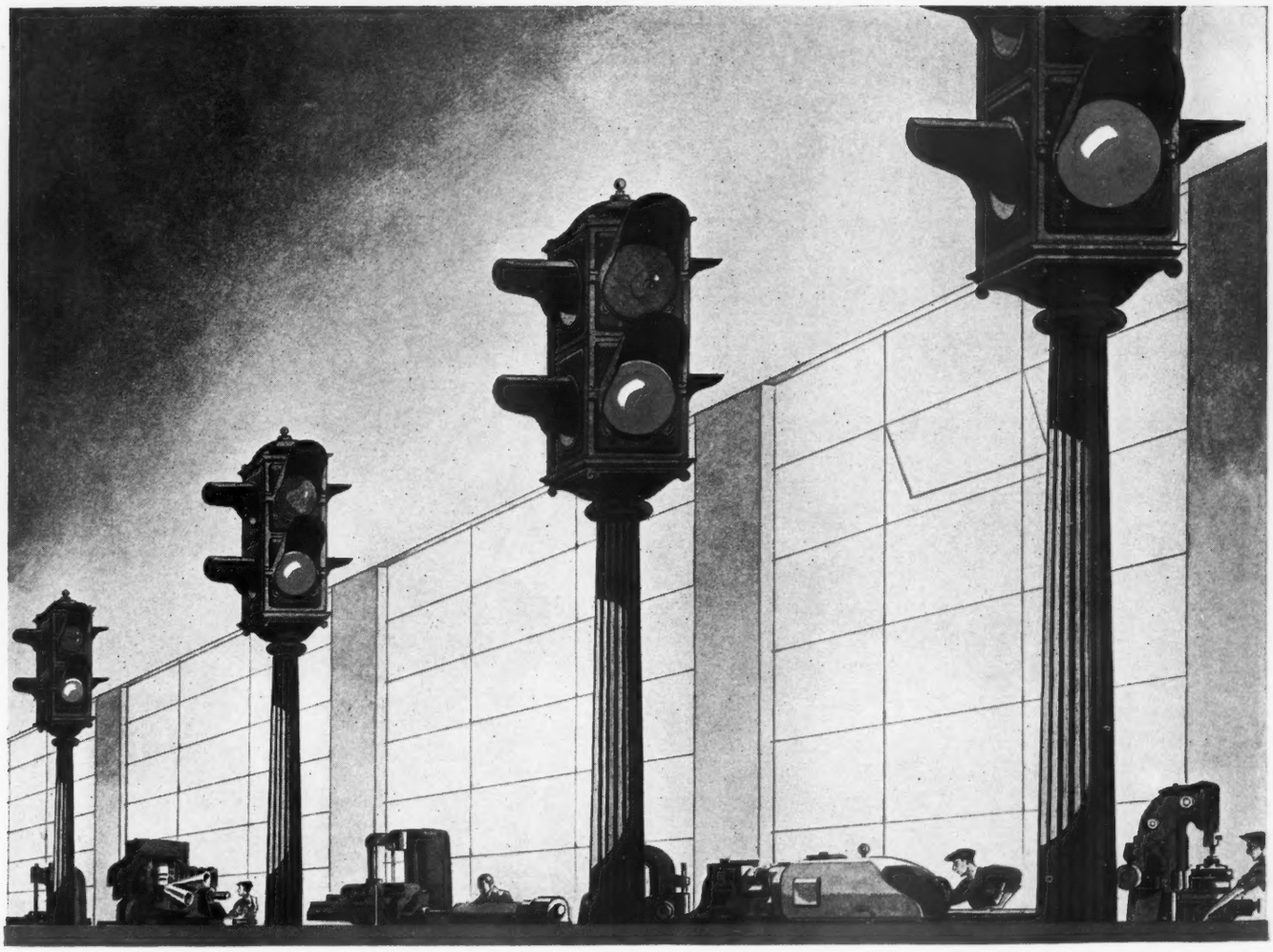
SAFEGUARDING MEN, AS WELL AS MACHINES

Whether the program will succeed or fail rests with the employees, foremen and management who carry it out. Accordingly, the plan is designed for your *men*, as well as your *plant*.

AMERICAN MUTUAL LIABILITY

AMERICAN MUTUAL *Works*

American Mutual has branches in 56 of the country's principal industrial centers. In addition to Workmen's Compensation, it offers opportunity for savings on Automobile, Fidelity Bond, and practically all other lines of liability insurance.



3 PROFIT OPPORTUNITIES FROM —

Loss Prevention Service which frequently lowers insurance costs and prevents time losses, lowered morale, etc., resulting from accidents.

Specialized Medical Treatment of injuries which helps reduce the severity of accidents and often restores valued men to their jobs.

20% Dividends Since 1887. For more than half a century every policyholder has been returned in dividends at least 20% of premiums. This record of consecutive dividend payments exceeds that of any other American liability insurance company.

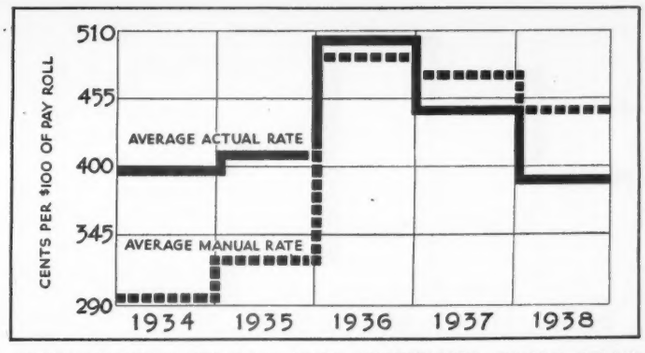
GET THE FULL FACTS —

FREE — Send coupon for free booklet describing our safety and medical service. No obligation.

INSURANCE COMPANY

to Make All Work Safe

Admitted Assets: $34,866,615.84 *Liabilities; $29,443,222.08*
Surplus to Policyholders: $5,423,393.76 *As of Dec. 31, 1937*



COSTS REDUCED FROM 37% ABOVE COMPETITORS, TO 12% BELOW

The solid line in the chart shows workmen's compensation insurance rates per $100 payroll paid by our policyholder—broken line: average rates for similar New York State firms. With our help, rates were brought down from 36.6% above average in 1934 to 11.7% below average last year. Dividends brought them still further savings.

American Mutual Liability Insurance Company
Dept. S-2, 142 Berkeley St., Boston, Mass.

Please send me "Methods of American Mutual in Safety and Rehabilitation Work".

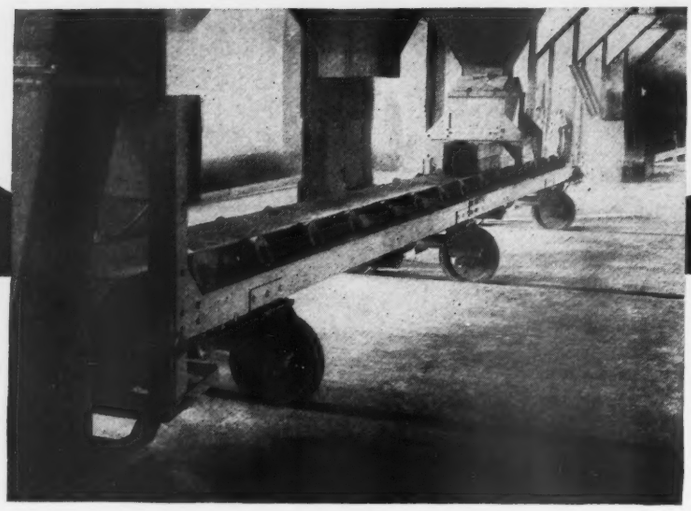
*Name*_____ *Title*_____

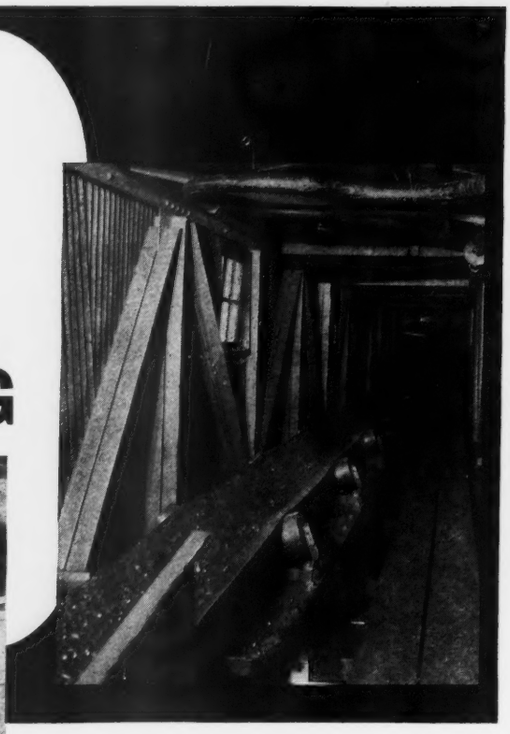
*Firm*_____

*Street*_____

*City*_____ *State*_____

REFINED SYRUPS & SUGARS, INC. PICK Thermoid CONVEYOR BELTING





The above photograph pictures one of three 18" Thermoid Conveyor Belts installed at this plant. Belts carry coal approximately 135 feet and at an angle of 25 degrees. Photograph at left shows another 18" Thermoid Conveyor Belt installed on a shuttle conveyor.

Refined Syrups & Sugars, Inc., are moving into a newly purchased plant at Yonkers, N. Y. In specifying Thermoid on all conveyor installations in this new plant they based their selection on Thermoid's proven performance in mills all over the country. They know that each belt has years of satisfactory service built into it and that their operating overhead on conveying will stay at the lowest possible cost per ton.

When you consider replacements or new conveying installations, be sure you get all the information on Thermoid Conveyor Belting. There's the right belt for each particular type of material. For any special problems our engineering staff is available without obligation.

More than half a century of progressive engineering and product development.

THERMOID RUBBER, DIVISION OF THERMOID COMPANY, TRENTON, N. J.

Standard types of belting made by Thermoid:
Conveyor Belting
Transmission Belting
Multiple-V Belts
Grader Belting
Canners' Belting
Bucket Elevator Belting

Thermoid

Standard types of belting made by Thermoid:
Grain Elevator Belting
Agricultural Belting
Hog Scraper Belting
Endless Thresher Belting
Oil Country Belting
Axle Lighting Belting

BELTING HOSE PACKINGS BRAKE LININGS

STANOIL PASSES ONE-YEAR TEST ON

HEAVY DUTY COMPRESSOR SERVICE

● After a year of operation on gas compressors in a large gas distribution station, Stanoil was chosen without hesitation for use in a duplicate installation made by the same company. Stanoil's cleanliness was one important factor in this choice.

Stanoil also gives complete freedom from troublesome deposits in air compressor service. Unlike ordinary oils Stanoil is made to resist oxidation. That is, injurious hydrocarbons—those easily converted into carbon and asphaltic deposits by oxygen and heat—have been removed from Stanoil by a special refining process. That is why Stanoil gives trouble free service in bath-oiled, circulating or hydraulic systems.

Let a Standard Lubrication Engineer specify the correct grade of Stanoil for just one job in your plant. Let Stanoil prove its value in reducing oil consumption, oil system cleaning and equipment maintenance.

Copr. 1939, Standard Oil Co. (Ind.)

STANOIL

STANDARD OIL COMPANY (INDIANA)

NG...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICA

...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICA

THESE MANUFACTURERS FOUND THAT—

...THE RIGHT LUBRICANT PROPERLY APPLIED REDUCES COSTS...

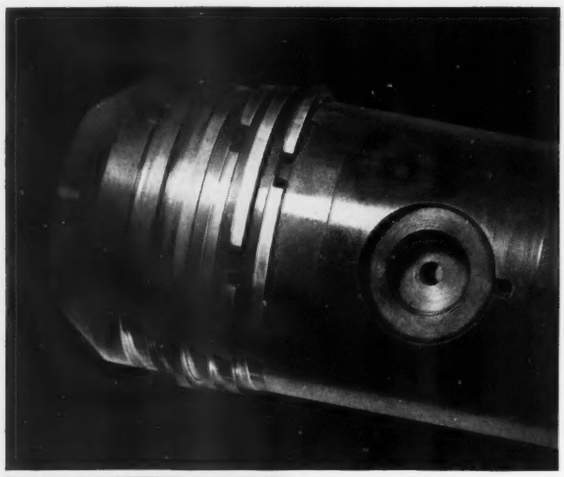
● Down go your costs when Standard Oil's Lubrication Engineers and Lubricants team up to do a job for you. They've made savings for others as shown in the pictures below. The cost—just the price of a phone call or card to your nearest Standard Oil (Indiana) office! Why not make that call today?

Standard Lubrication Engineers are located in 30 offices throughout the 13 states shown below. They are there solely to help you make better use of the highly developed lubricants in Standard's line—to make your lubricating dollars go further.

Call in your Standard Lubrication Engineer. Have him explain more fully just what he does. Write Standard Oil Co. (Indiana) 910 S. Michigan Ave., Chicago, Ill. for the Engineer nearest your plant.

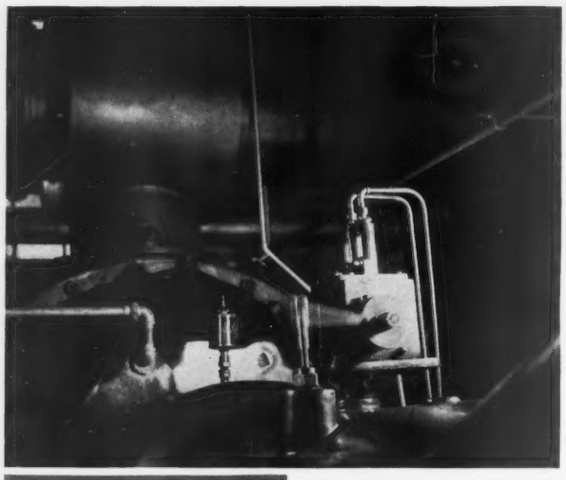
SUPERLA GREASE

High paper speed was playing hob with bearings on three new newspaper presses. The trouble? The grease was the same as that formerly used on old, slower equipment. Enter the Standard Lubrication Engineer. He recommended Superla Grease. That was five years ago, and there have been no burned bearings since.



NONPAREIL DIESEL OIL

After lubricating two 19-year old Diesels for the past nine years with Nonpareil Diesel Oil, a municipal power plant engineer writes, "These engines have not been overhauled in the past two years and we have not had a shutdown in that time." When a new 450 KW Diesel engine was installed at this plant last year, Nonpareil was given the job without hesitation, on the basis of its eight year record for cleanliness.



STANOIL

Valve cleaning was a weekly job on the compressor in a central state foundry. A Standard Lubrication Engineer analyzed the deposits on the valves and found them to be unstable parts of oil and core sand. With the compressor oiling system thoroughly cleaned, and Stanoil installed, the weekly cleaning job was eliminated—which more than paid for the slightly higher cost of Stanoil.

"SPARE THE TIME TO SPARE YOUR MACHINES"

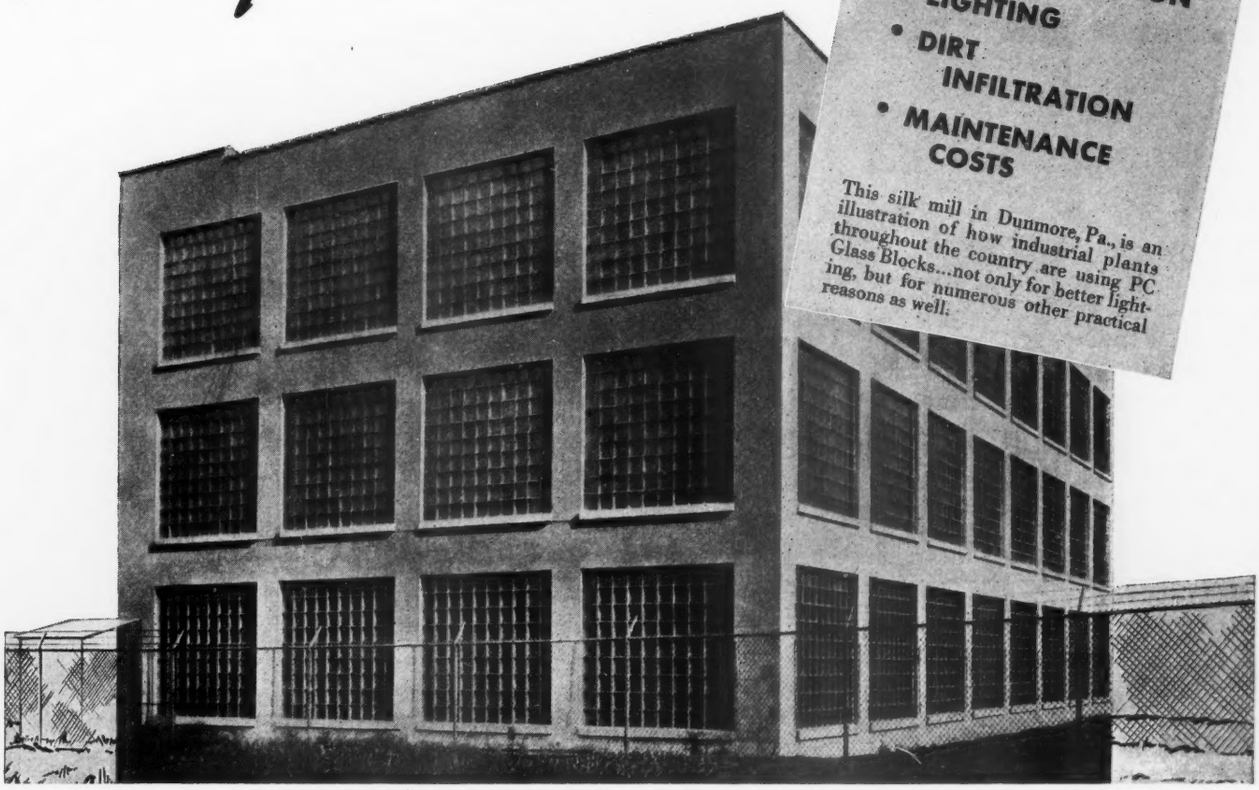
is the title of a new booklet describing the latest development in lubrication—a new all-purpose oil that can replace 27 brands of oil now in use on a wide range of applications and do a *better lubricating job* on each. To keep up-to-date on new lubricating practices you should have this booklet. It's free. Just write Standard Oil Co. (Indiana) 910 S. Michigan Ave., Chicago, Ill.

Are any of these Problems *YOUR* Problems?

If so . . . use

PC Glass Blocks

- HUMIDITY CONTROL
- TEMPERATURE CONTROL
- MOISTURE CONDENSATION
- LIGHTING
- DIRT INFILTRATION
- MAINTENANCE COSTS



This silk mill in Dunmore, Pa., is an illustration of how industrial plants throughout the country are using PC Glass Blocks...not only for better lighting, but for numerous other practical reasons as well.

IN actual service in all parts of the country, PC Glass Blocks have proved a simple and economical cure for a host of factory ills. Those mentioned above are some of the commonest problems facing manufacturers. And in every case, PC Glass Blocks can contribute importantly to their solution.

A panel of these blocks combines the light transmission properties of glass with approximately the insulation value of a solid masonry wall. Thus, if temperature must be accurately controlled in your plant, panels of PC Blocks will help you do it far better than ordinary light areas. Further, moisture will not condense on the warm side of a PC Glass Block panel except under severest conditions. Humidity control becomes easier when PC Blocks are used. Better plant lighting results, because panels of these blocks transmit daylight generously. At the same time, they guard privacy, insulate effectively against outside noise. They are easy to clean. Eliminate dirt infiltration at light areas. Cut maintenance costs by eliminating necessity for replacement and repainting of metal or wood sash.

Investigate this amazing material for factories. See what PC Glass Block construction can do for you. Send the coupon below for our free book of information. And plan to see the exhibits of Pittsburgh Glass in the Glass Center Building, the Forward March of America Building, and the All-Glass House at the New York World's Fair, and in the Homes and Gardens Building at the Golden Gate International Exposition. PC Glass Blocks are manufactured by Pittsburgh Corning Corporation.

Distributed by

PITTSBURGH PLATE GLASS COMPANY

and by W. P. Fuller & Co. on the Pacific Coast

PITTSBURGH PC CORNING *Glass Blocks*

Pittsburgh Corning Corporation,
2121-9 Grant Bldg., Pittsburgh, Pa.

Please send me, without obligation, your new book of facts about PC Glass Blocks entitled "The Glass Age Arrives."

Name_____

Street_____

City_____ State _____

HERE'S A NEW, EASY WAY to Improve Your Lighting at Materially Lower Costs

IT'S recognized as excellent management, these days, to improve industrial lighting—using incandescent lamps of higher candlepower in new and modern reflectors, the highly effective G-E mercury-vapor light sources, or the sensational new fluorescent lamps.

It's a proved fact that better lighting speeds up production, improves quality, reduces spoilage, and steps up morale.

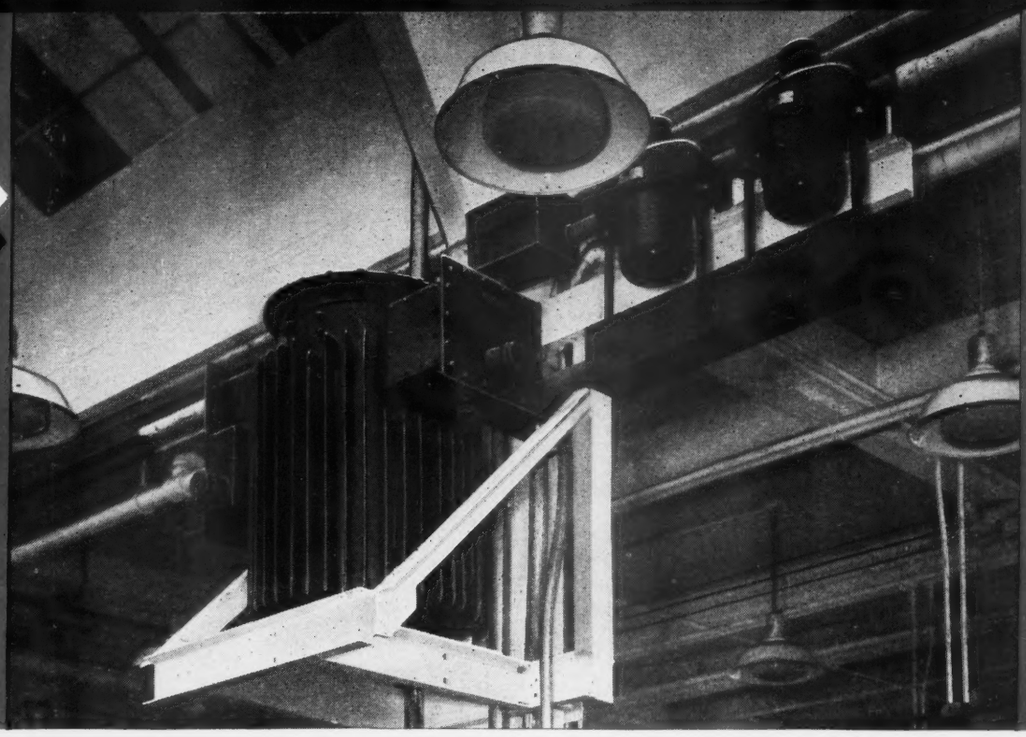
But the big deterrent in the past has been the cost of modernizing the wiring, not the cost of the lamps or reflectors or the cost of operating more powerful light sources.

General Electric, when recently confronted with this problem in its Pittsfield works, turned to one of its products which has been solving many other industrial problems—Pyranol transformers.

Because Pyranol, the liquid in these transformers, is noninflammable and nonexplosive, the transformers can be placed anywhere in the factory, without a fireproof enclosing vault. This meant that we could divide the existing lighting circuit into several short sections, install a small Pyranol transformer near the ceiling to serve each section, and modernize the lighting at a much lower cost than by any other method.

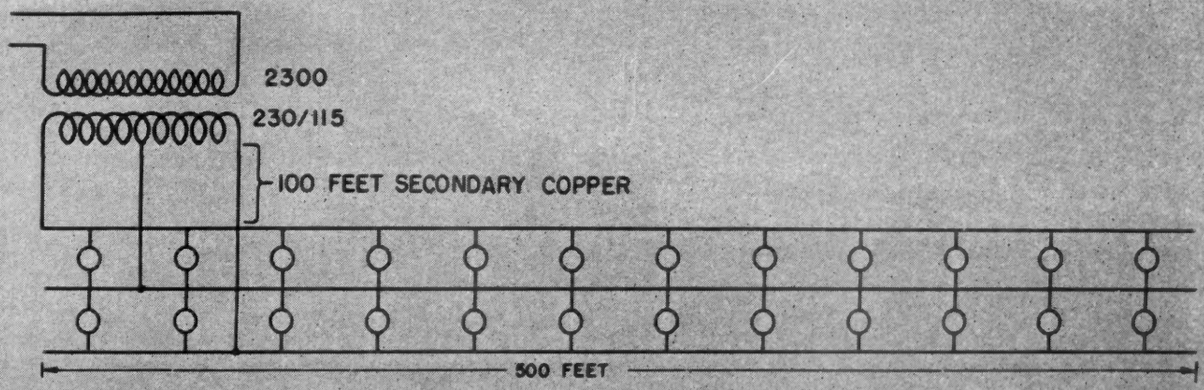
The sketches at the right graphically depict the simple solution. Investigate this method before you relight your next bay, floor, or building—and before making *new* installations—and specify G-E Pyranol transformers for use in your plant. Ask your G-E representative for complete details, or write for Publication GEA-3180. Address General Electric Company, Dept. 6 -201, Schenectady, New York.

If you want the ultimate in precise voltage control for your lighting, use one of these new G-E air-cooled voltage regulators on the secondary of each transformer. The total cost will still be less than with the old method. Ask for Bulletin GEA-3057.



Install your new lights. Use your old secondary wiring. Install small Pyranol transformers right at the load—near the ceiling —out of the way.

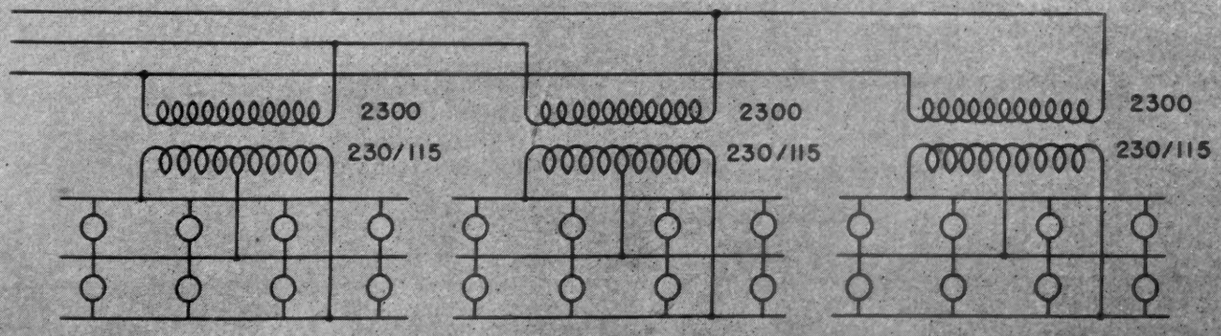
HERE WAS THE OLD METHOD — ASSUME COST AS 100%



New transformer in substation outside building—complete new secondary copper.

HERE'S THE NEW, LOW-COST METHOD — 60% COST OF OLD METHOD

(One of the three power sources is shown in the picture at the top of this page)



NOTE

Install new primary feeder (small copper). Use existing secondary wiring, dividing it into several circuits. Install one Pyranol transformer in center of each circuit.

GENERAL ELECTRIC

300-80

● Every feature of this fast, easy-operating hoist makes it *right* for your purposes. The zinc coated finish of every part prevents corrosion. Precision load wheel bearings provide smooth, speedy, positive action. Because of the load chain safety guard, the load chain cannot ride out of the pocket, regardless of position. *These are only a few of Wright's 21 points of superiority.*

You can have a Wright Improved High Speed Hoist in capacities from ¼-ton to 40 tons, and in combination with various types of Wright Trolleys and Cranes. Send for your copy of the new Wright Catalog—a helpful manual on hoisting equipment.

BUY ACCO QUALITY *in Wright Hoists, Tru-Lay Preformed Wire Rope, Reading-Pratt & Cady Valves, Campbell Abrasive Machines, American Chains, Page Welding Electrodes and Page Chain-Link Fence.*

WRIGHT MANUFACTURING DIVISION
YORK, PENNSYLVANIA

AMERICAN CHAIN & CABLE COMPANY, Inc.

AMERICAN CHAIN DIVISION • AMERICAN CABLE DIVISION • ANDREW C. CAMPBELL DIVISION • FORD CHAIN BLOCK DIVISION • HAZARD WIRE ROPE DIVISION • HIGHLAND IRON AND STEEL DIVISION • MANLEY MANUFACTURING DIVISION • OWEN SILENT SPRING COMPANY, INC. • PAGE STEEL AND WIRE DIVISION • READING-PRATT & CADY DIVISION • READING STEEL CASTING DIVISION • WRIGHT MANUFACTURING DIVISION • IN CANADA: DOMINION CHAIN COMPANY, LTD. • IN ENGLAND: BRITISH WIRE PRODUCTS, LTD. • THE PARSONS CHAIN COMPANY, LTD. • *In Business for Your Safety*

Amazing NEW POWER GUN

STANDS UP UNDER PUNISHMENT FROM WORLD'S LARGEST STRIP MILL

PUMPING heavy lubricant under high pressure direct from the original drum, this brand new Alemite Electric Hydraulic Gun (Model 6689) is used *every half hour* to lubricate bearings of the *largest continuous strip mill in the world!*

Red hot billets weighing 3000 pounds each pass through these 98-inch rolls. Bearings are exposed to terrific heat—to steam, hot water and scale. *Their resistance to lubrication presented a real problem.* Until the development of this new Alemite Gun, steel companies had found no lubrication equipment which could endure such strenuous service more than a short time!

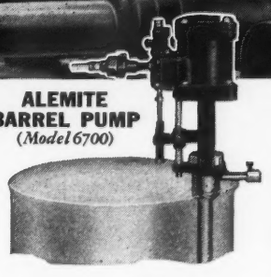
This new Alemite Model 6689 delivers heavy lubricant at the rate of 2½ pounds per minute, under continuous pressure up to 3000 lbs. per sq. in. *Both pressure and volume of delivery are adjustable.* Pressure is constant, evenly sustained, not subject to "highs" and "lows."

Whatever your lubrication problem, consult Alemite's experts about it! Let an Alemite System, power or manually operated, cut your costs, speed your production, *help you get better service and longer life* from your expensive machinery! Write to us!

ALEMITE—A Subsidiary of Stewart-Warner Corporation
1870 Diversey Parkway, Chicago, Ill.
Stewart-Warner-Alemite Corporation of Canada, Ltd.
Belleville, Ontario

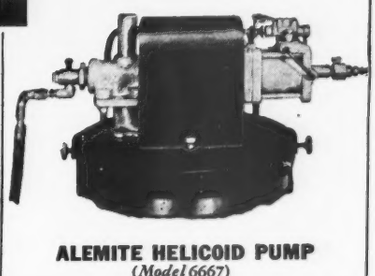
ALEMITE MEASURING PUMP
(Model 6433)

Alemite Measuring Pumps are available in two sizes, Model 6432 delivering up to 6 oz., and Model 6433 up to 16 oz. of lubricant per "shot"—amount determined in advance by setting screw handle at top of pump. Both models operate by hand or foot valve. Both fit into bung of 400-lb. drum, operating on 70 to 100 lbs. of air.



ALEMITE BARREL PUMP
(Model 6700)

For Volume Delivery with High Pressure. Air-operated unit; pumps lubricant direct from 400-lb. drums. Ideal for assembly line lubrication, conveyors, large bearings, and gear housings. Available in various piston ratios. Operates on 75 to 175 lbs. of air. Delivers 6 to 15 lbs. per minute at pressures from 600 to 6,000 lbs. per sq. in., depending on piston ratio and air pressure.



ALEMITE HELICOID PUMP
(Model 6667)

Pumps Heavy Lubricant. Fits open head 100-lb. drum; delivers heavy fibrous lubricant at pressure 33 times available air pressure (100 to 200 lbs.) Agitator at bottom brings lubricant to helicoid or spiral in center column, whence it is drawn into high pressure chamber.

ALEMITE "ROCK CRUSHER"
(Model 6528)

Air-operated Alemite Power Gun; easily handles heavy lubricants at pressures 33 times air pressure (100 to 200 lbs.) Helix arm and worm in tank pulls lubricant into high pressure cylinder for positive prime and freedom from air pockets. Capacity, 40 lbs. Electric "Rock Crusher," Model 6524, also available.

ALEMITE

REG. U. S. PAT. OFF.

WORLD'S LARGEST MANUFACTURER OF LUBRICATION PRODUCTS

It's front page

Thor Drill

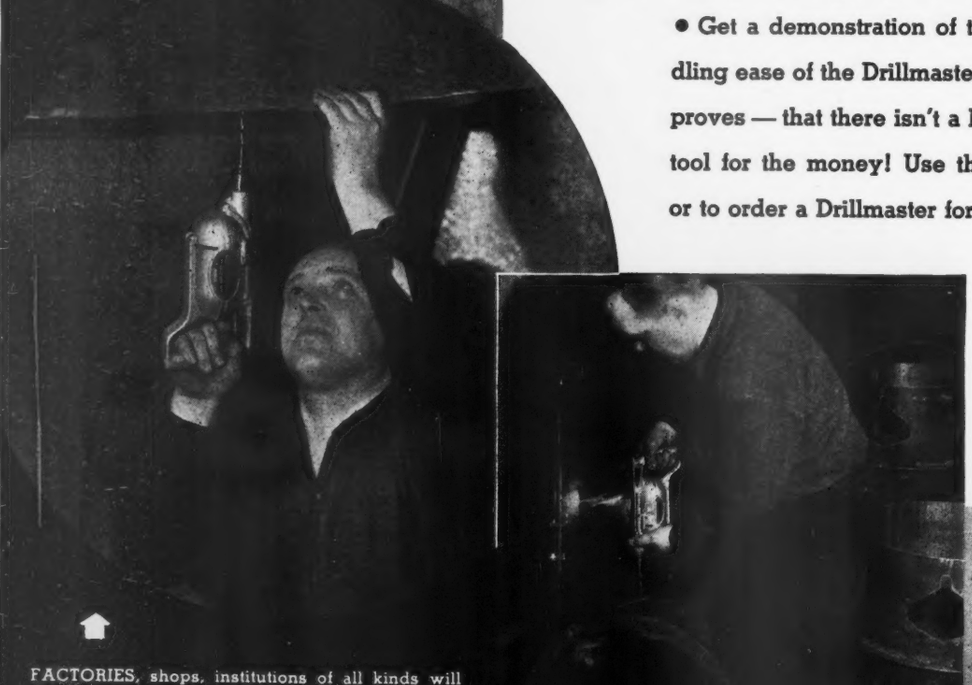
- A ¼" Drill for General, Light-duty Service.
- Small and compact . . . only 12" long overall.
- Just 4 lbs. in weight . . . perfectly balanced.
- Dependable power . . . the most efficient motor ever put in a tool in its price class.
- Sturdy construction . . . oil-less bearings, alloy-steel gears, strong aluminum housing.

THE DRILL

THAT WAS 45 YEARS OLD BEFORE IT WAS BORN!

All that Thor has learned in 45 years of manufacturing quality portable power tools has been applied to the new Drillmaster — the first low-priced electric drill to be built in the fine-tool tradition. The Drillmaster, with its time-tested features, brings Thor quality within the reach of every tool user.

• Get a demonstration of the amazing power, performance and handling ease of the Drillmaster. See for yourself why Thor claims — and proves — that there isn't a light-duty ¼" drill in the running with this tool for the money! Use the coupon below to get more information or to order a Drillmaster for 10 days free trial. Do it today!



FACTORIES, shops, institutions of all kinds will find the low-cost Drillmaster ideal for general maintenance and all-around, light-duty drilling.

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New York Philadelphia Detroit St. Louis Los Angeles

LIGHT DUTY, intermittent drilling in wood or metal is handled efficiently and economically by the new Drillmaster.

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$19.95

¼" CAPACITY PORTABLE ELECTRIC DRILL

DRILLMASTER SPECIFICATIONS

CAPACITY . . . . . ¼"
FREE SPEED . . 2000 R.P.M.
WEIGHT . . . . . 4 LBS.
LENGTH OVERALL . . . . 12"

UNIVERSAL MOTOR, 110 OR 220 VOLTS. JACOBS CHUCK, RECESSED THUMB-CONTROL SWITCH, 3-CONDUCTOR CABLE AND PLUG.

The Quality Drill in the Low-Price Field

Thor offers more!

IN

PORTABLE ELECTRIC TOOLS

USE THIS COUPON TODAY!

INDEPENDENT PNEUMATIC TOOL CO. D-51
600 W. JACKSON BLVD., CHICAGO, ILLINOIS

Please send me:
☐ *Full information on the new ¼" Drillmaster*
☐ *One ¼" Drillmaster for 10 days Free Trial*
(check voltage desired ☐ 110 volts ☐ 220 volts)

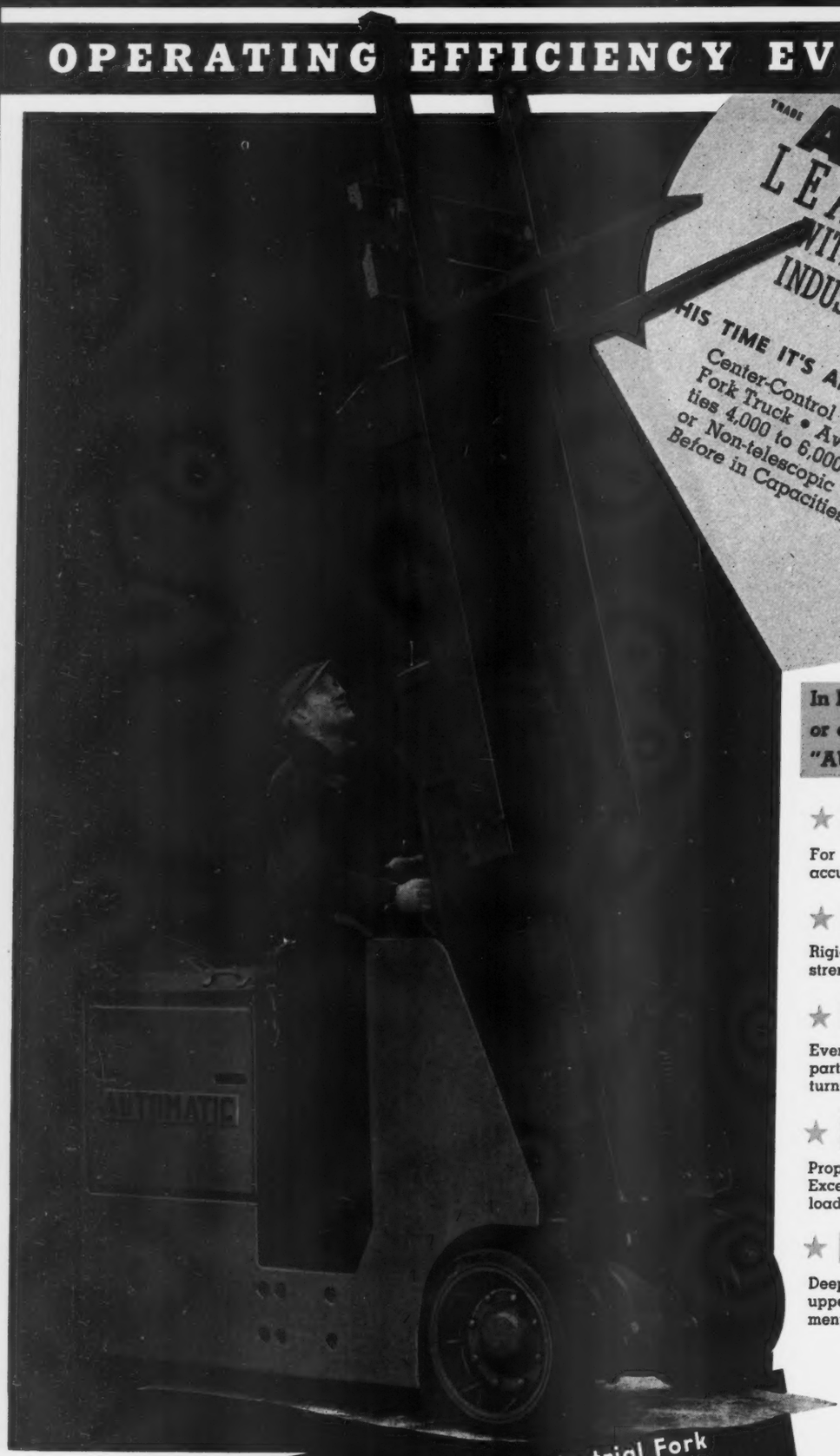
NAME .....

FIRM NAME .....

ADDRESS .....

CITY .....STATE .....

GREATEST FLEXIBILITY AND OVERALL OPERATING EFFICIENCY EVER ACHIEVED



TRADE **AUTOMATIC** MARK
LEADS AGAIN!!!
WITH AN ENTIRELY NEW
INDUSTRIAL FORK TRUCK
FOR 1939

THIS TIME IT'S ANOTHER NEW "AUTOMATIC"
Center-Control • Front Wheel Drive Fork Truck • Available Now in Capacities 4,000 to 6,000 Pounds in Telescopic or Non-telescopic Models • Available Before in Capacities 7,000 to 30,000 Lbs.

In NO other competitive fork truck, conventional or otherwise, will you find ALL the ALL-STAR "AUTOMATIC" features such as these.

★ **CENTER-CONTROL**

For unobstructed operating visibility with safety and accuracy

★ **ALL-WELDED FRAME**

Rigid box type deep sectioned construction of exceptional strength and stability

★ **COMPACT DESIGN**

Every inch of space accounted for with accessibility to all parts. Shortest wheelbase, overall length, height, width and turning radius and aisle operation possible.

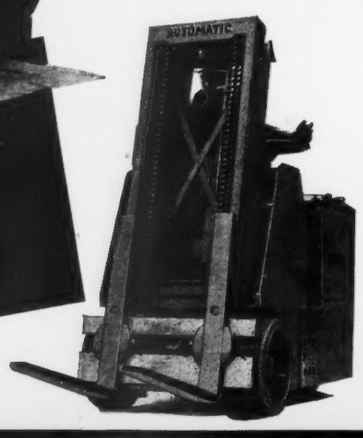
★ **LOW CENTER OF GRAVITY**

Proper load distribution fore and aft. Perfect balance. Excessive counterbalancing avoided. Maximum *Active* Pay load attained with *Minimum Dead* weight.

★ **SOLID MACHINED UPRIGHTS**

Deep channel sections of high tensile steel. Lower and upper sections RIGIDLY CROSS-BRACED for perfect alignment LATERALLY—LONGITUDINALLY

Here again is the ONLY Industrial Fork Truck which has ALL the New ALL-STAR features so essential and vital for Modern Mechanized Materials Handling.

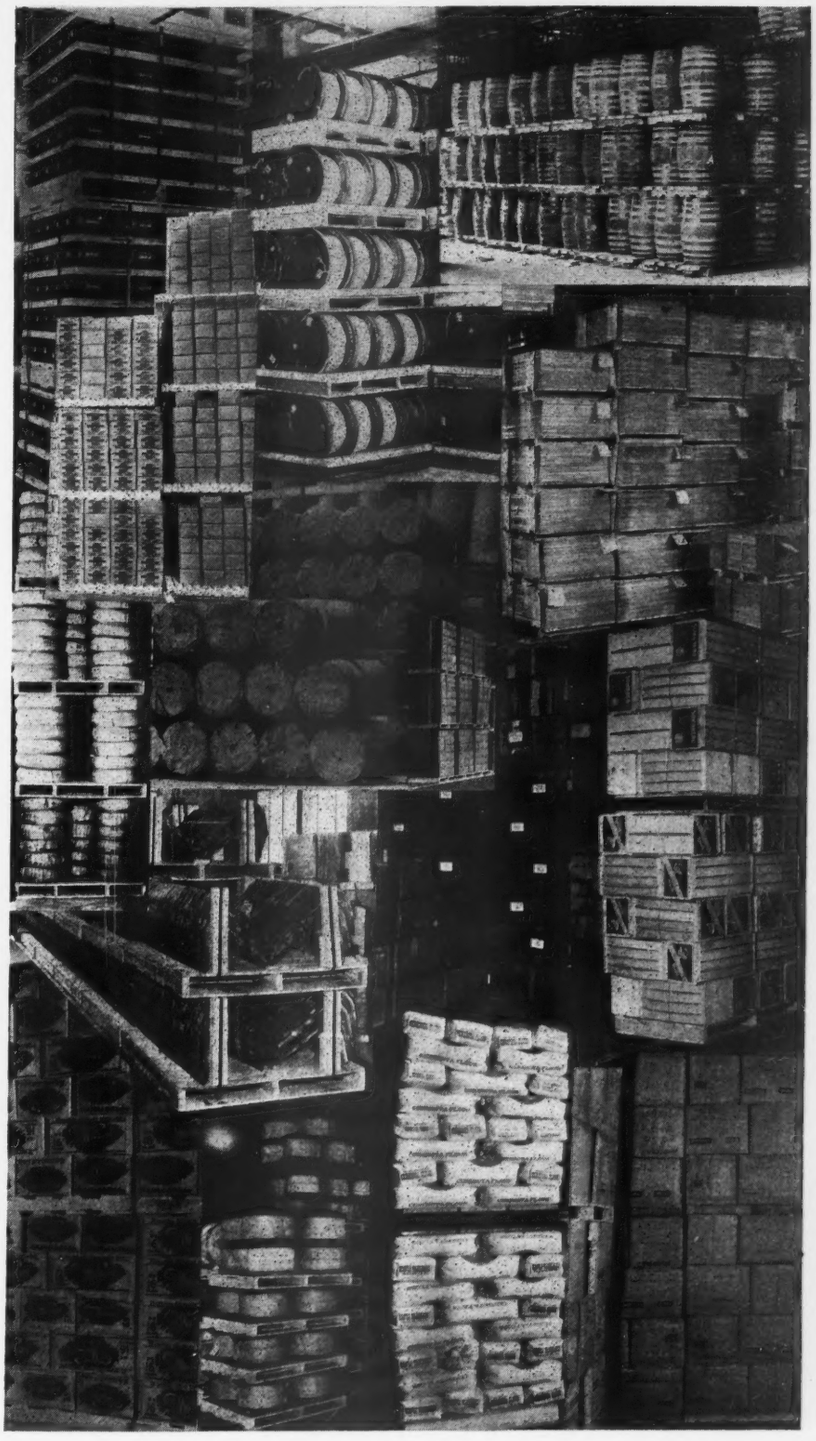


Already in a comparatively short time this *New* "AUTOMATIC" has won a nationwide acceptance as the *New Leader* in Industrial Fork Trucks.

WHEN YOU BUY TRUCKS . . Rush "AUTOMATIC

BUILT FOR UNIVERSAL APPLICATION IN *Every* INDUSTRY

This *New* "AUTOMATIC" Center Control Fork Truck makes possible for the first time IMPROVED "AUTOMATIC" SYSTEMS for unit load transportation . . . multi-stacking . . . loading and shipping which can be developed with utmost speed and precision . . . efficiency and economy . . . safety and flexibility.



VERSATILITY

This *New* "AUTOMATIC" Center-Control lift truck can be equipped with standard or special forks, rams, scoops, revolving roll mechanism and other special attachments to suit *your* individual requirements.

It is *YOUR* answer to *YOUR* Material Handling Problems.

No doubt you have a material handling problem to which this new "AUTOMATIC" can be successfully applied as a system. To eliminate needless expensive handling. To increase storage capacity. To cut material production costs. To simplify inventory.

What the "AUTOMATIC" system has done successfully, profitably for other concerns, it can do for you.

★ SPECIAL LIFT CHAINS

Have high factor of safety with built-in neutralizing device to prevent chain oscillation.

★ NEW MECHANICAL UNITS

Spur gear DRIVE • LIFT • TILT Each designed for highest efficiency with minimum current consumption. All gears run continuously in oil.

★ DOUBLE SHIELDED BEARINGS

Precision type bearings shielded against foreign matter.

★ "AUTOMATIC" HEAVY DUTY MOTORS

Industrial truck type flange mounted for perfect alignment and rigidity

★ IMPROVED "AUTOMATIC" STEERING

Perma-sealed dirt proof casings. Ball bearing joints mounted with self-compensating wear feature.

★ CENTER PIVOTED TRAIL AXLE

Fully equalized with castor type trail wheels for shockless right angle steering.

★ "ROTOR-BRUSH" CONTROLS

Group mounted for dependable precision control of every unit.

★ DYNAMIC FORK SPEED CONTROL

Electro-interlock for safe control of lowering speeds.

These and many other ALL-STAR "AUTOMATIC" features and complete details await your review in the New Bulletin No. 5483.

Avail yourself of the opportunity right now. Write for "AUTOMATIC" Engineering Service. Without obligation, we will analyze and survey your handling application.

USE THE COUPON

AUTOMATIC TRANSPORTATION COMPANY
DIV. OF THE Y. & T. MFG. CO.
39 W. 87th STREET CHICAGO, ILLINOIS

Gentlemen: Please send me complete details on the *NEW* "AUTOMATIC" Center-Control Fork Truck.

*Name*_____

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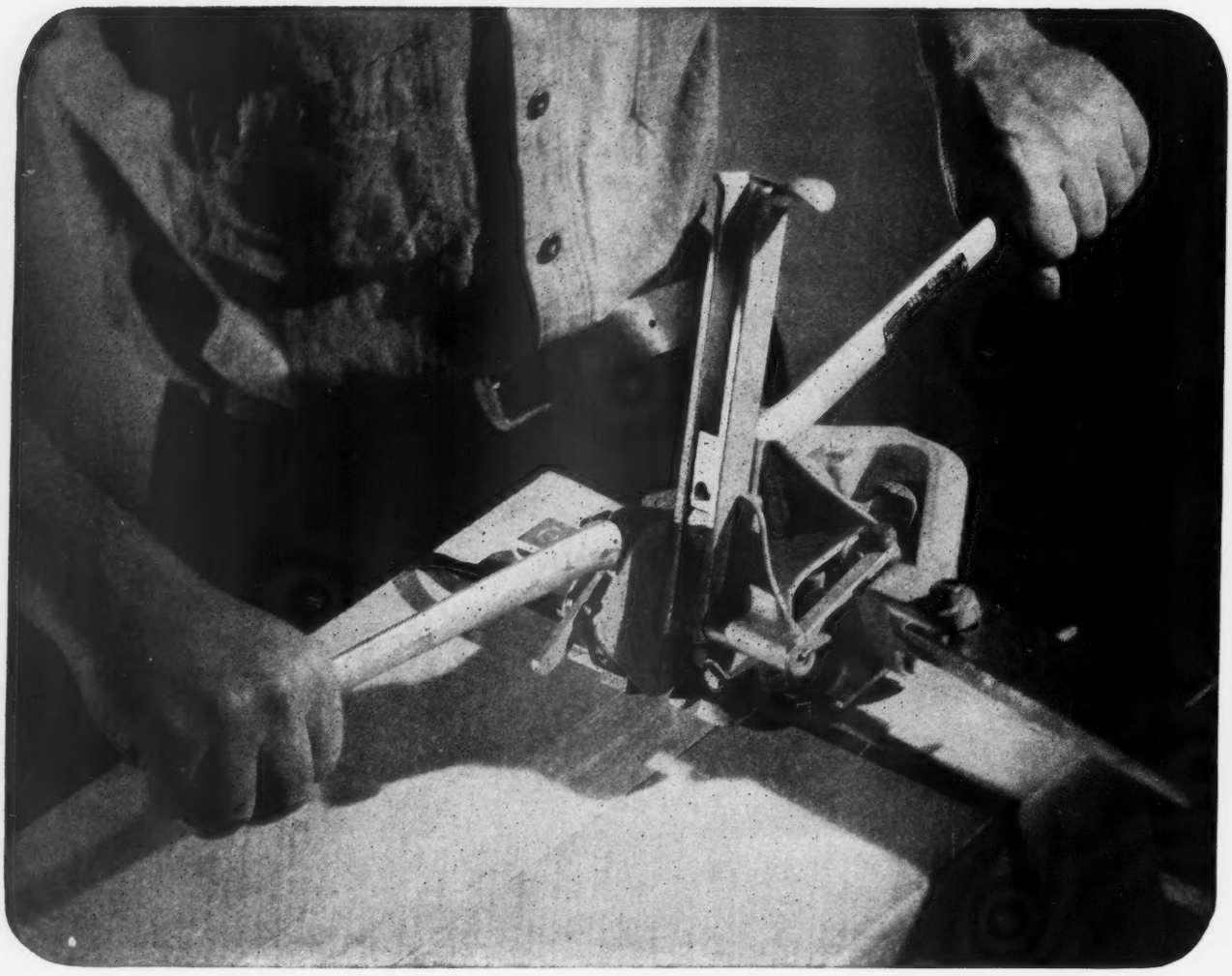
*City*_____ *State*_____

USE THE COUPON FOR FURTHER DETAILS



55 YEARS OF EXPERIENCE BEHIND THIS STRAPPING TOOL

and in these many years of close co-operation with carriers and shippers has come a responsibility to provide equipment for quickly, easily and economically making every shipment "Bound to Get There." The new No. 2 Steelstrapper, the latest addition to the complete line of Acme equipment, is the only strapping tool which combines stretching, sealing and cutting operations with an automatic seal feed. ● Acme Steelstrap is sold *only* by Acme sales engineers. They are competent and fully qualified to make practical suggestions for safer, more economical packing of *any* type of product in any kind of wrapping or container. ● By using the Acme Steelstrap system, shipping and packing cost reductions from 10% to 40% have been made by more than 20,000 shippers. A complete estimate of the amount which *you* can save will be furnished on request. Write for complete information, today. There is no obligation.

ACME STEEL COMPANY
2831 ARCHER AVENUE, CHICAGO, ILLINOIS
BRANCHES IN PRINCIPAL CITIES

BYERS WROUGHT IRON

COMBATS CORROSION IN STEAM LINES . . .
WET RETURN LINES, AND CERTAIN OF THE PROCESS LINES

for Beech-Nut
PACKING COMPANY

CALL THE ROLL OF
AMERICAN INDUSTRIES

Beechnut Packing Company, Canajoharie, N. Y., makers of Beechnut gum and other famous products provide further evidence that manufacturers of quality products always purchase quality plant equipment. In steam lines, wet return lines, and certain of the process lines, Beechnut Packing Company engineers use Byers Wrought Iron.

Somewhere in every plant, corrosion is a threat. Neglected, it can be costly. Anticipated, it can be controlled. If you have some problem where corrosion is causing premature failure of plates or piping, write us about it. Our Engineering Service Department will (1) Determine the probable corrosive conditions; (2) Relate these to similar conditions encountered elsewhere; (3) Interpret the results in the light of experience gained in 75 years' contact with corrosion problems; and (4) Make recommendations . . . supported by service records.

A new Byers General Catalog has just been completed. Ask for a complimentary copy.

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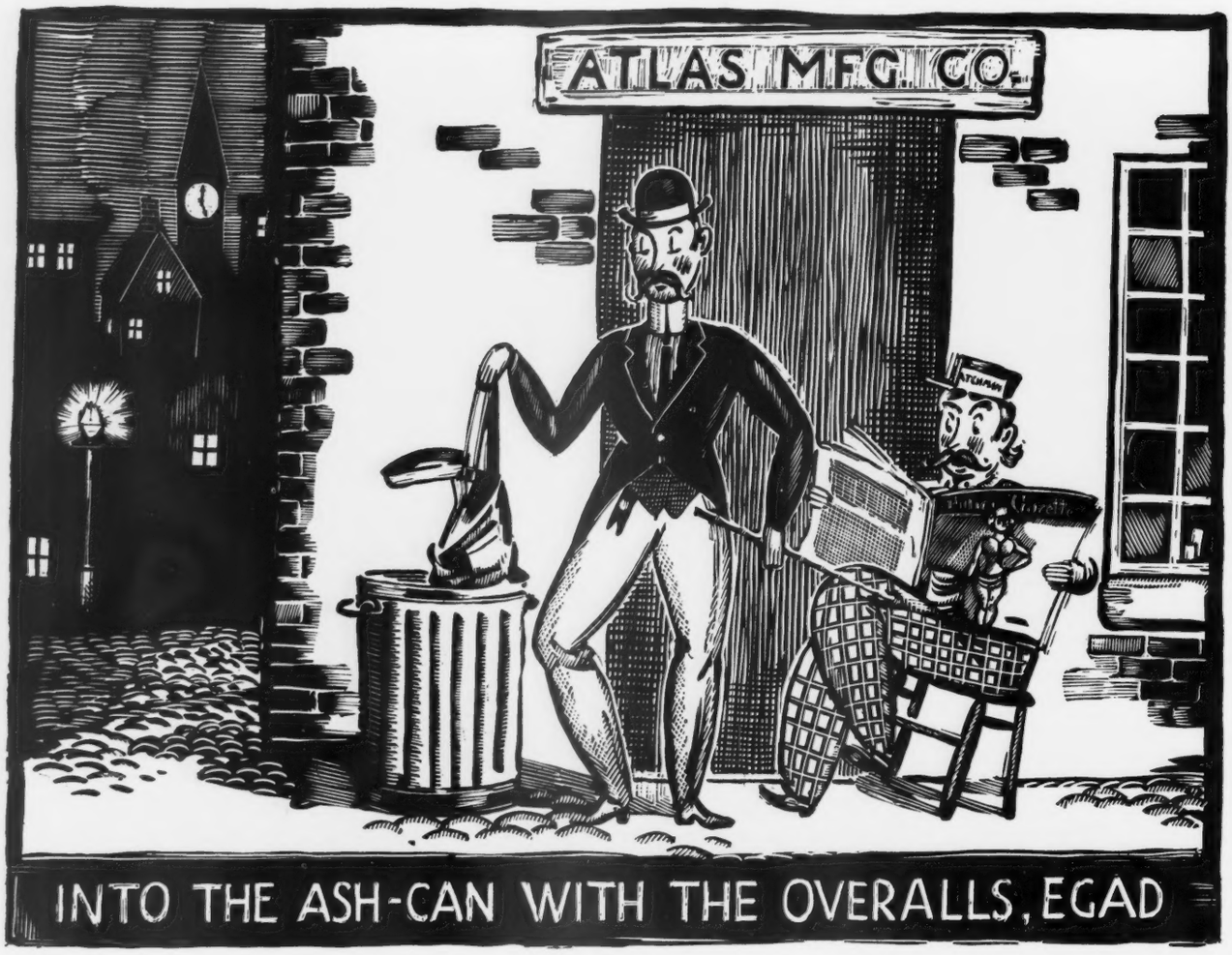

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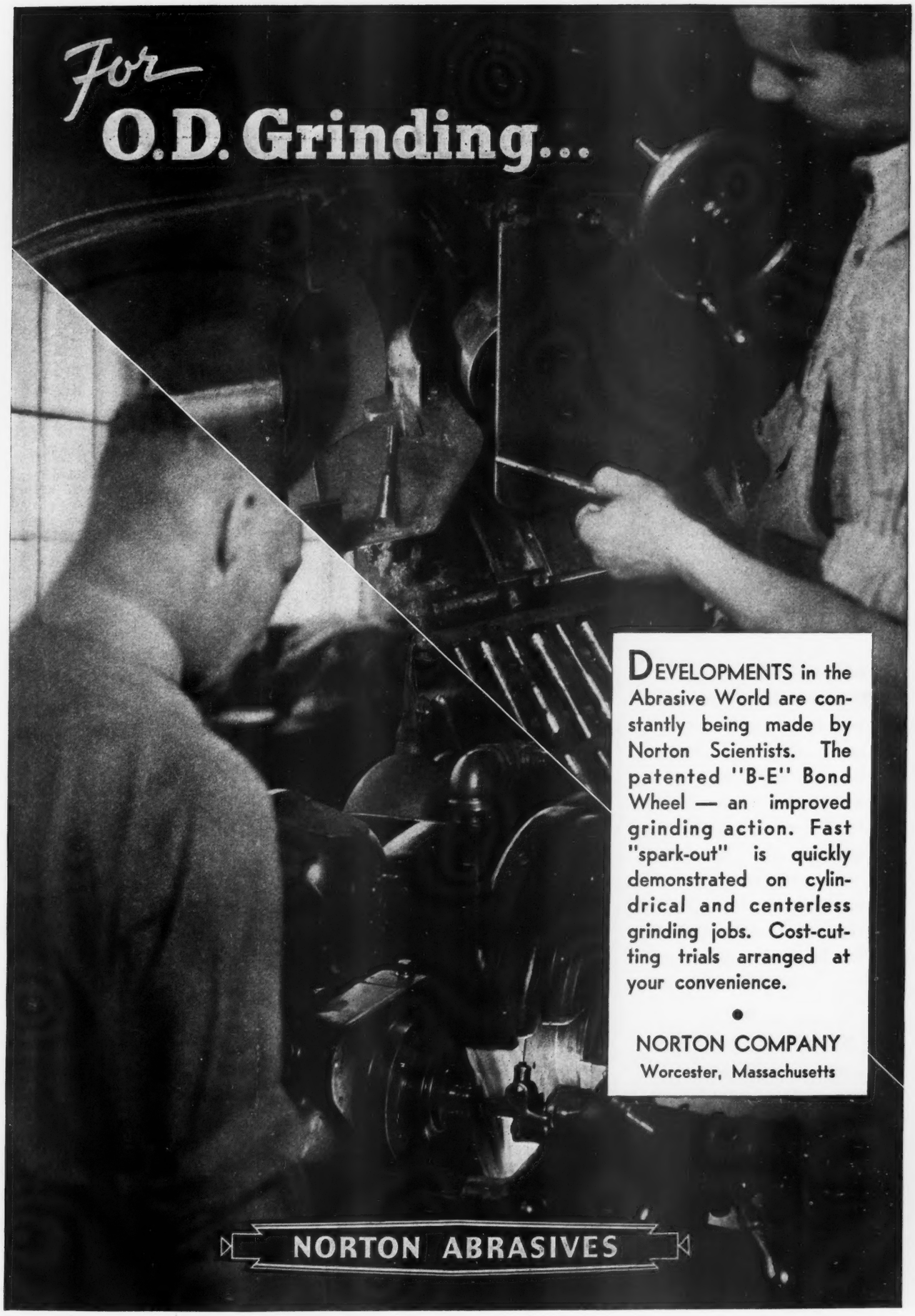
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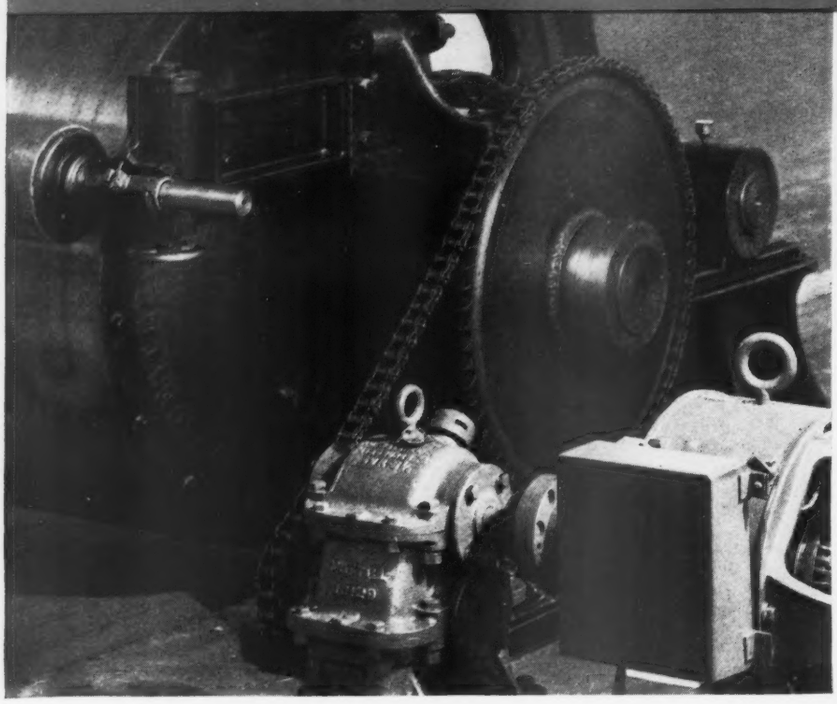
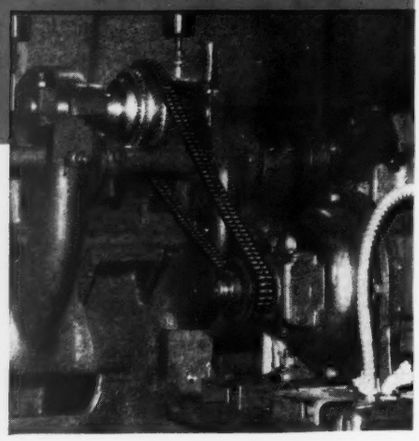
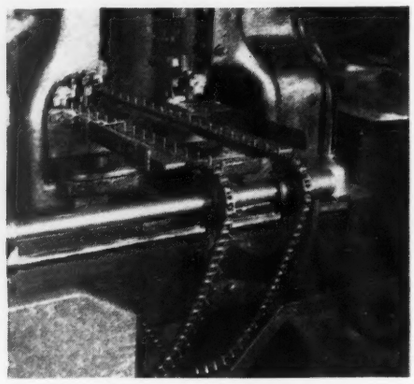


(3) The Pope Uniform speed reel on this coating machine is driven by Baldwin Roller Chain.



(1) TWO SETS OF SPROCKETS — ONE CHAIN — an economical method of getting two speed ratios on an automatic screw machine. Chain case removed for photo.



(2) SPECIAL ATTACHMENTS on Baldwin Roller Chain carry hack saw blades through punch press.

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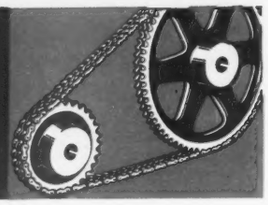

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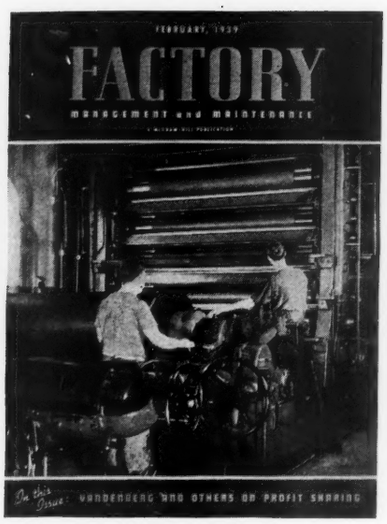

Second in FACTORY's series of full-color photographs shows a portion of the calendering operation in Eastman Kodak Company's own paper mill. It was taken with the new Professional Kodachrome Type B Film. The four-color plates were made by a cost-halving process recently perfected by J. A. Lucas, who has long headed up McGraw-Hill's illustration department.

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FACTORY

MANAGEMENT and MAINTENANCE

FEBRUARY, 1939

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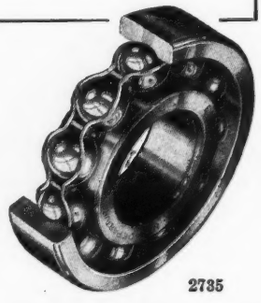

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MANAGEMENT and MAINTENANCE

L. C. MORROW, *EDITOR*

PROFIT SHARING IS NOT A CURE-ALL

Profit sharing by wage earners is an alluring proposal. There is evidence that it has worked, in some instances, to stabilize employment, increase wage-earner incomes, lower production costs, and increase profits. Enough such evidence exists to indicate that every manufacturer should examine fairly the probabilities of favorable results to his own business and his own employees if he adopts a profit-sharing plan.

But, regardless of the success of the individual application, profit sharing by wage earners throughout industry must stand a final test. Will it add to wealth produced? If it is to serve only to change the distribution of wealth, it is doomed to failure. It is because not enough wealth is produced that people do not have enough. No change in distribution will make up for that deficit.

That wage earners, as a result of sharing profits, would add appreciably to wealth produced, is doubtful. As a group, wage earners would be satisfied only when their share of profits was in the nature of a bonus. Profits accrue, in the capitalistic system, as a result of risk. Wage earners want security, not risk.

As was said in FACTORY, in May, 1937, "It is a basic principle of the capitalistic system that the risk-taking function is assumed by the enterpriser. As a reward for risk, the enterpriser receives profits—a non-contractual share. The wage earner has traded his claim upon windfall returns for a stable income which approximates a moving average of his value to his employer's business.

"This division of functions and rewards is fundamental to the capitalistic system. It is one of the contributions of the system to economic evolution. The great majority of working people cannot and do not want to become risk takers."

What are the alternatives? They were named in the source quoted above:

1. Spread potential bonuses into wage levels that can be sustained despite minor recessions.

2. Extend salary basis of payment to as many as possible.

3. Increase appropriations to pension reserves.

4. Establish funds for sickness, invalidity, and unemployment benefits supplementing governmental programs.

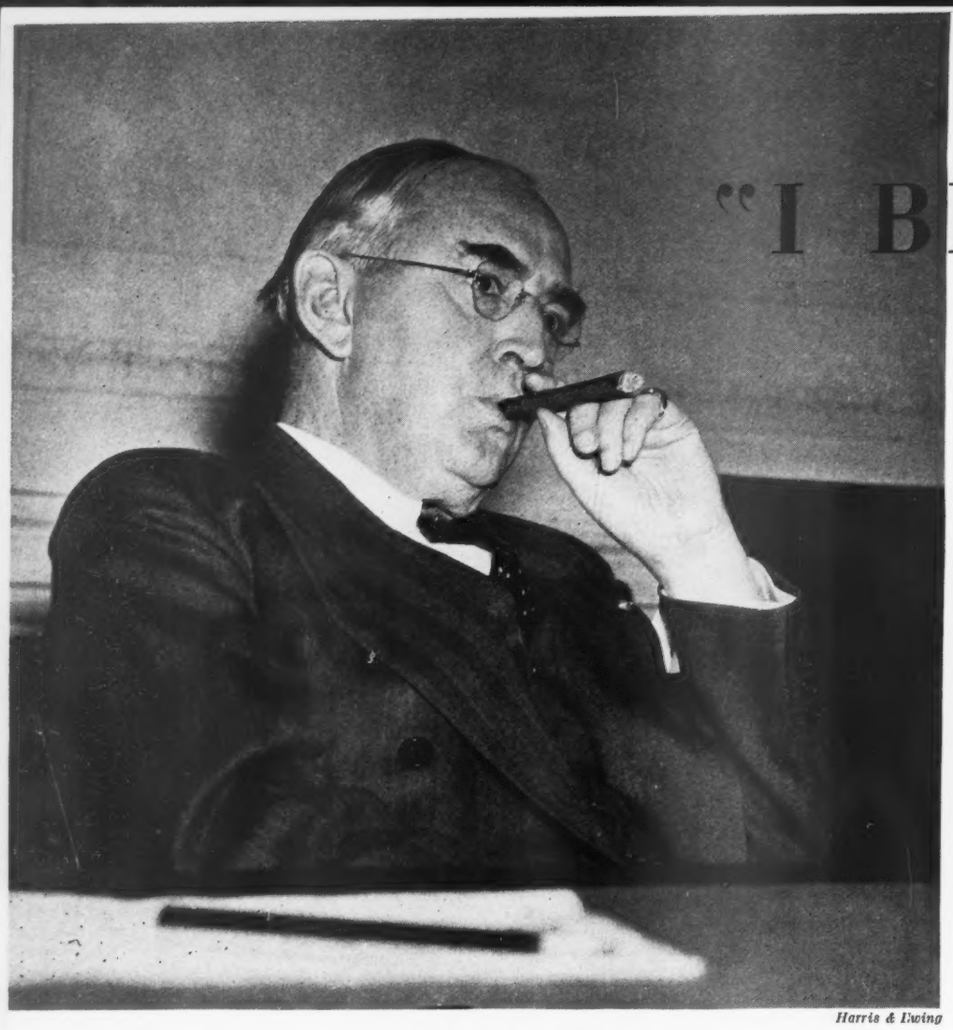
During the year 1938 a sub-committee of the Senate Finance Committee made a study of profit sharing along the lines laid down in a resolution by Senator Vandenberg, of Michigan. The resolution looked toward making available a record of experiences with profit sharing and the possible encouragement of profit sharing by the Federal Government through the instrument of compensatory tax exemptions and tax rewards when profit sharing is voluntarily established.

By its survey, a report of which will be published soon, the sub-committee has rendered a genuine service to industry. It will render a further service if it will refrain from making recommendations in favor of tax exemptions and rewards. It is the firm conviction in many quarters that the taxing power should never be used for purposes other than the production of revenue. But, aside from that, there is so much question as to the practicability of profit sharing by wage earners that forced stimulation of the practice should not be undertaken.

(In the following pages Senator Vandenberg's views on profit sharing are presented. Given also are outlines of plans in successful operation by six companies and the profit-sharing opinions of the heads of those companies.)

L C Morrow

"I BELIEVE



Harris & Ewing

SENATOR VANDENBERG

THE CENTRAL THOUGHT that should guide American business in its social and economic thinking is this: We want to avoid socialism, but we've got to embrace social-mindedness. The only answer to irrational radicalism is rational liberalism!"

And there you have the basic philosophy of Senator Arthur H. Vandenberg, of Michigan, the Republican whose gift for expressing the moderate viewpoint forcefully has made him Washington's best bet for the GOP nomination for President. Foremost among the foes of government interference with industry, he sponsored the Senate Subcommittee* that will soon report on its investigation of profit sharing as a means to industrial peace.

What is the source of Vandenberg's interest in profit sharing?

"I have always operated it in a limited way in my own 25 years' experience as an employer," he replies. "And the philosophy behind it has always seemed to me to be the essence of industrial democracy. We've always tried to maintain a partnership between capital and labor. And I've never heard of a realistic partnership that stopped short when the time came to divide the profits."

Senator Vandenberg was long the successful editor of the Grand Rapids *Herald*, a paper that reflected his civic-minded views.

"We are constantly asking the American people to preserve the profit system of capitalism, and I've always felt that the best possible way to understand what we mean by the profit system and capitalism would be to bring the largest possible number of our people into intimate, pocketbook touch with profits—and thus make potential capitalists out of them.

"In other words, I don't think you can expect to sustain capitalism indefinitely on a one-sided basis. People whose destiny is tied to a conscious connection with profits will understand what you're talking about when you mention capitalism.

"I've felt that way since the first day I took a job myself. I've always believed that the ideal economic society under so-called democracy and so-called capitalism will be a profit-sharing society.

"That requires an immediate bill of particulars. I fully recognize that Henry Ford, for example, is a tremendous sharer of profits when he establishes a minimum wage of $6 a day. I fully recognize that all the forward-looking industrial devices for employee life insurance, employee retirement pensions, and so forth, are a form of profit sharing. For example, although Mr. Sloan of General Motors started out his testimony before our committee by saying he wasn't a profit sharer, and didn't believe in it, it speedily developed that, over a 20-year period, approximately 9½ per cent of General Motors' earnings went into employee benefit and welfare plans.

"The truth of the matter is that a large section of American industry, far from being the benighted blackguard that some high officials of government have tried to paint it in the last few years, has voluntarily embraced the various phases of profit sharing to an amazing extent. "And in 95 out of 100 cases an authentic analysis reveals that every such adventure has proved to be not only humane but also good business.

"Another thing ought to be said at this point: The emphasis that my Senate resolution suddenly put on profit sharing ought not be interpreted to mean that labor has not often received its full share and proportion of the net operations in which it has engaged. Furthermore, I fully recognize the fact that profits have to be made before they can be shared and that wealth has to be created before it can be divided.

An Exploratory Adventure

"So you can see that there has been nothing fundamentally critical in my approach to the question. Rather, it has been an exploratory adventure, to see if better employee-employer relationships cannot be encouraged by a new approach to an old problem.

"I should oppose any effort to dictate from Washington a standard profit-sharing formula to *all* American commerce. It just can't be done. The business of this country is too big and too complex to be run from Washington. My purpose has been simply to create an authentic record of American experience with various forms of profit sharing for the volun-

* Of which Senator Herring of Iowa was chairman and Senator Johnson of Colorado was a member.

IN PROFIT SHARING"

Says Senator Arthur H. Vandenberg of Michigan

"But I should oppose any effort to dictate from Washington a standard profit-sharing formula to all American commerce"

AN INTERVIEW BY A MEMBER OF *FACTORY'S* EDITORIAL STAFF

tary consideration of any employer who wants to study its possibilities in respect to his own institution.

"My own conviction, at the conclusion of the inquiry, is that my original conceptions of profit sharing are confirmed."

Does that mean that Senator Vandenberg will include incentive tax exemptions, to encourage profit sharing, among the tax provisions that he, as a member of the Senate Finance Committee, will sponsor at this session?

"Emphatically not!" the Senator replies. He *is* an advocate of tax exemptions as incentives to industry to make capital expenditures and to stabilize employment.

"But I'm not as yet certain that the principle of incentive taxation can be applied in the profit sharing field," he continues. "My thinking has been along the lines of simpler cases—such as plant expansion and equipment replacement. You might say, for example, that the merit rating system in unemployment insurance is a beautiful example of incentive taxation."

No Foolproof Tax Formula

But what about the point raised by M. B. Folsom, of the Eastman Kodak Company, at the recent hearings? (Mr. Folsom pointed out that incentive tax exemptions are a reverse application of punitive taxation, a precedent possibily useful to the advocates of the latter.)

"I freely concede the force of that statement," says Senator Vandenberg. "The choice of the incentive entirely governs the utility of the idea. That *is* its great weakness. Therefore it must be approached with the utmost prudence and care. Yet there never will be a tax formula that is foolproof, and I think the hazards of incentive taxation are relatively fewer than the hazards that are inherent in most tax formulas.

"At any rate I don't expect to introduce a profit-sharing incentive bill at this session. New economic ideas can create as many problems as they solve. I'm not prepared to rush in where angels fear to tread, although, on the other hand, I'm not afraid to look at something new."

No specific proposals for profit-sharing exemptions will be made by the senate subcommittee when it issues its official report, possibly this month. The report will include some general observations on the feasibility of profit sharing in industries where it is not now widely practiced. The subcommittee has drafted a formula, based on the principal elements of two of the most successful company plans now in operation, which it has theoretically superimposed on the financial structures of 60 large concerns in 10 different industries.

A report will be made on this and on the subcommittee's survey of *employee* opinion as ascertained in a questionnaire sent to wage earners in 100 plants.

During the hearing, a witness, C. P. Cooper, vice-president of the American Telephone & Telegraph Company, observed that profit sharing tended to emphasize booms and depressions rather than level out the peaks and valleys of industrial activity.

"That's probably right, but what of it?" Senator Vandenberg says. "Profit sharing is not proposed for the stabilization of the whole national economy but for the stabilization of employee-employer relations, and that's justification enough."

Another, John L. Lewis of the CIO, said inferentially that profit sharing might be a good deal more acceptable to organized labor if it made some provision for a greater participation on labor's part in the actual management of industry.

"I think that is one of the complications which must finally be faced in any consideration of profit sharing," says Vandenberg. "The strikingly successful profit-sharing plans of the country have not involved any interference with management. On the contrary they have established such friendly relationships, such mutual confidence between management and labor that management uniformly testifies that its task has become easier, rather than more difficult.

Candor Is the Secret

"The necessity, in a successful profit-sharing plan, is not that labor shall share in management, but rather that it shall share in complete information regarding the profit operations of the institution. *Unless candor is contemplated in this connection, profit sharing should be entirely rejected.* But candor is the secret of a happy employee-employer relationship.

"Profit sharing is *not*, in any sense, a substitute for good wages. It is *not* a weapon to be embraced merely as an employer strategy in a labor war.

"But if undertaken in the true spirit of economic partnership, as a long-range means to assure labor of its final participation in the profits it helps to produce, it is calculated, more than any other procedure, to encourage and to stabilize industrial peace. And it inevitably invites an efficiency of production which makes it a sound business investment as well as an achievement in economic democracy."

What the Profit Sharing Record Shows

An analysis by the National Industrial Conference Board

THE DEFINITION of profit sharing accepted by the National Industrial Conference Board includes only those plans that "provide to participating employees payments in cash, stock, or future credits that bear some definite relation to the profits earned by the company during a definite period."

Hundreds, perhaps thousands, of industrial employers pay occasional bonuses, but the number of those now practicing true profit-sharing plans is estimated at only 55 despite the stimulus of recent industrial recovery.

And among these the mortality rate remains high. In 1937, the Conference Board conducted a survey of 161 such plans and found only 50 active with 15 inactive, and 96 discontinued.

"Every rise in the business cycle has brought with it a revival of the idea of shared profits, but so far plans of this nature have not been widely accepted and many have not survived for any considerable period," the Board pointed out.

In subsequent pages, *Factory* presents summaries of several of the most successful profit-sharing plans and statements by the chief executives of the corporations concerned, setting forth the principal reasons for the success of their companies' plans.

Special interest attaches, therefore, to the Board's study of the causes of the failure of so many of the plans which came within the scope of its survey. In its report on the 96 firms that dropped profit-sharing plans, the Board found that in 43 per cent dissatisfaction on the part of the management or unfavorable response of the employees was the cause. The Board points out that "management's" dissatisfaction with profit sharing may be attributed largely to the workers' lack of interest in, or opposition to, the idea."

Thirty-one of these companies gave unfavorable reaction of employees as the direct cause for abandonment of profit sharing. Nineteen reported employee dissatisfaction or indifference; eight stated that the employees had preferred to receive the entire amount in their regular pay envelopes; and four blamed the agitation of labor unions. Six companies merely stated that the plans proved unsatisfactory and gave no other explanation. Five said that the plans had proved unsatisfactory and were replaced by other forms of compensation.

Twenty-one firms laid the failure of their plans to the continued absence of profits; fourteen reported changes in management, mergers, or discontinuance of business, and eight blamed government interference and high taxation. The remaining eleven firms gave no explanation for having discontinued their plans.

The chief cause of failure—employee dissatisfaction—"rose largely out of the inability of rank-and-file employees to understand the principles involved.

"The less intelligent workers were frequently incapable of understanding the relations between the profit-sharing plan and general business conditions, and were discouraged when factors beyond control of either the workers or management frustrated faithful and conscientious effort," the Board said. "Others could not comprehend why the plant might be busy and yet not be making money. In several companies the workers even took exception to the concerns' auditing methods or blamed management for the losses sustained."

While labor unions are not uniformly opposed to the plan, the Board found them generally tending against it for the same reasons given where the plan failed because of employee dissatisfaction.

"Even though management shares profits with employees only because it wishes to distribute company income on a basis more equitable to all, and is motivated chiefly by a desire to be generous, the results of the profit-sharing plan will not be entirely satisfactory unless the workers are educated in the basic principles involved," the Board concluded. "The future of profit sharing is problematical. Each rise in the business cycle brings with it plans designed to reward the workers in some measure for the hardships suffered during the depression and to give them an opportunity to share in the returning prosperity, but how large a proportion of all such plans will survive recurrent depression is an open question."

REASONS FOR DISCONTINUING PROFIT SHARING GIVEN BY 96 COMPANIES

Reason for Discontinuing Profit Sharing	Companies Represented	
	Number	Per Cent
Unfavorable reaction of employees		
Employee dissatisfaction or indifference	19	19.8
Employee preferred entire amount in pay envelope	8	8.3
Union agitation	4	4.2
Company dissatisfaction		
Unsatisfactory, no other explanation	6	6.2
Unsatisfactory, replaced by other compensation	5	5.2
Other causes		
No profits	21	21.9
Change of management, mergers, out of business	14	14.6
Governmental interference and taxes	8	8.3
No explanation	11	11.5

DEUPREE

Wide World

LOVEJOY

ROBERTSON

How Industry Looks at Profit Sharing

The heads of the companies whose plans are given on pages 43 and 44 write their views for FACTORY

No Substitute for High Wages

RICHARD R. DEUPREE
President, Procter & Gamble Company

OUR SYSTEM of profit participation is so long-established and has been discussed so frequently that I imagine most management men must be familiar with its principal features by now.

Rather than dwell over details, therefore, I shall take this opportunity to emphasize one salient aspect of the Procter & Gamble policy which perhaps has not been sufficiently remarked.

And that is this: Profit sharing, employee security, job stabilization, pension plans, and the like are *not* regarded by us as a substitute for high wages. I speak with conviction born of long experience when I say that profit sharing, undertaken merely as a substitute for raising wages, is doomed to almost certain failure.

Since 1929 we have increased hourly wages 50 per cent, although there has been no marked rise, during that period, in our pre-unit cost of production. It seems to me that management must accept the principle that good wages are the first condition of employee satisfaction and efficiency. If wages are better than average, then it is possible to build employee morale to a much higher pitch by means of profit sharing and similar plans.

Of course, there are many industries where profit sharing cannot be successfully applied in any case. The plan serves only the well-established, successful company in an industry where neither profit nor production fluctuates too violently.

Insures Better Cooperation

FRANK W. LOVEJOY
President, Eastman Kodak Company

WE ARE CONVINCED from our twenty-six years of experience that profit sharing is a very desirable and effective method of bringing about better cooperation between the workers, the management, and the stockholders. Since, in our case, the wage dividends to employees go up and down with the dividends to the stockholders, the employee can more readily appreciate that his and the company's interests are to a large extent mutual. This spirit of cooperation is reflected in the attitude, efficiency, and longer service of the worker, and in corresponding benefit to the company.

While the wage dividend has been an important factor in the development of the general program of the company, it must be remembered that it is only a part of a comprehensive policy of industrial relations which includes the payment of a fair rate of wages; the provision of suitable and safe working conditions; reasonable hours of work; stability of employment, as far as possible; a definite intention on the part of management to see that all employees receive a "square deal"; and methods for assist-

ing employees in making provision for their economic security. While our wage dividend is not taken into consideration in fixing wages, for tax purposes it is regarded as income to the individual and as a deductible expense of the company. That affords the company only the normal benefits to which we believe it is entitled, and we do not favor the establishment of tax exemptions or the granting of tax rewards to encourage profit sharing.

The Company Must Tell

A. W. Robertson
Chairman of the Board
Westinghouse Electric & Manufacturing Company

ONE OF THE GUIDING principles of the Westinghouse policy is the identification of the employee's aims and interests with those of the company. I believe our wage and salary payment plan, so closely linked to actual earnings, has brought us much closer to the practical application of this principle.

Of course, it would not be possible to elicit any very high degree of employee interest in the company's affairs unless the company, in turn, exhibited a friendly interest in helping the employee to meet his own problems. This we have tried to do through other financial provisions designed to enhance employee security.

Another highly important principle —a basic one, I believe—in such a program is this: The company *must* be prepared to furnish to employees the most frank, complete, and understandable information about its affairs.

It's Good Business

Gerard Swope
President, General Electric Company

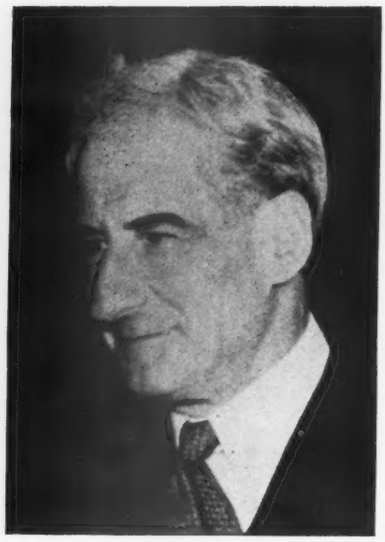
I BELIEVE in the practice of sharing profits with employees because I think it is good business to do so. Even so, as I told a Senate group recently, I don't *know* that it is.

But it seems to me that the fundamentals of any profit sharing plan should be:

First, that sharing of profits is not in lieu of fair wages, but in addition thereto.

Second, that to be effective for the employees, such a plan must be accompanied by a savings plan, so the employees can put away as large a portion of the profit sharing as possible, against the inevitable "rainy day."

Third, that the profit sharing should be paid in cash, or in securities the employees may either retain or dispose of, depending upon the situation of the individual employee.



SWOPE

Harris & Ewing

FRANK

FOSS

Skeptical About Tax

J. M. Frank
President
The Ilg Electric Ventilating Company

WE ARE NOT prepared to vindicate our profit-sharing plan on grounds of altruism. I don't believe the question should be approached that way. Either profit sharing is good business or it is not, and a great deal depends on the company that undertakes it.

For us profit sharing has been good business—and I think that's all the vindication it needs. Most of our employees are stockholders. They have an interest as great as management's in the company's prosperity.

The employee efficiency engendered by profit sharing should be its own reward. I am somewhat skeptical about incentive taxation designed to stimulate profit sharing. However, with a thorough discussion of this subject, legislation may be devised that will combine the subject of profit sharing with that of stabilization of employment, in which case incentive taxation might be very desirable.

For Smaller Plants, Too

Walter R. Foss
President
The Wooster Brush Company

THE FACT that we have continued a liberal profit sharing plan for so many years is evidence that we feel it has been justified. While we are not contemplating any changes in our present plan, if we should make any it would be to liberalize it even more because we are convinced that the future will show even a greater tendency to split the income dollar with our employees.

As to whether we would recommend it for other companies, we believe that profit sharing plans of the type we employ are of the greatest benefit to smaller manufacturers. In our own case, with our various plans of this nature, we can definitely say that it has kept our labor turnover to practically a negligible figure. It has decreased waste, also breakage of machinery and equipment. It has increased the quality of our products. It has created self-imposed and practically automatic supervision which has been decidedly beneficial to the company operation. It has even been instrumental in assisting our sales.

Six Successful Profit Sharing Plans

Eastman Kodak Company

IN 1912 the Eastman Kodak Company adopted a profit-sharing plan and has paid a "Wage Dividend" to employees each year since then with the exception of the depression year 1934.

The wage dividend is paid by the company as an extra return to employees in the form of a dividend on their wages, just as a return to stockholders is a dividend on their investment. It is a recognition of the contribution that loyal, steady, and efficient workers make to the success of the company.

Any employee who has worked 26 weeks or even 26 days in 26 different weeks during the previous year is eligible to participate, although length of service is important as the wage dividend is apportioned according to each employee's total earnings for the preceding five calendar years. In 1937, 24,087 employees out of 27,052 participated.

This typifies the working of the plan: Employee A has earned $2,000 a year for 5 years, a total of $10,000. In 1937 the company's dividend on its common stock was $4.50 more than $3.50—below $3.50 no bonus is paid—or $8. Employee A got ½ of 1 per cent of his 5-year earnings for each dollar of dividend declared over $3.50 or 2¼ per cent—$225.

Because of the business recession, the common stock dividends declared in 1938 declined to $6 per share, and the wage dividend recently declared for payment in March, 1939, will be at the rate of 1¼ per cent of the 5 years' wages, or, for employee A, $125.

The management has for many years given attention to the regularization of employment and to this end now endeavors to schedule its production on a fairly level basis throughout the year. In spite of highly seasonal demand for some of its products, marked stability of employment has been achieved with comparatively few seasonal lay-offs.

In addition, provision is made for group life insurance, retirement annuities, and benefits for total and permanent disability, all provided through a definite plan underwritten by a responsible life insurance company; payments to employees temporarily incapacitated by illness; a medical service designed to conserve health; personal loans in case of emergency; and vacations with pay.

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The Wooster Brush Company

UNDER WOOSTER'S long-established plan, every one of the company's employees knows he will receive a share, in proportion to his earnings, of a sum representing 15 per cent of the year's net profits after payment of 50 cents a share on common stock.

The company was a pioneer in group life insurance. Since 1919, it has paid all premiums on employee policies. This is supplemented by an employee sick benefit plan, by incentive bonuses for skill and accuracy, and by annual vacations at full pay.

Recently a minimum guaranteed wage plan was instituted to give employees an ever greater sense of security. The minimum wage took the place of a monthly bonus of 10 per cent—over and above the yearly bonus—which had been paid since 1932 in any month in which the company showed a profit.

President Walter R. Foss, whose family has guided the destinies of the company since 1851, reports that the minimum guarantee has proved even more acceptable than the monthly bonus. Turnover is a thing unknown to this plant. Last year all its 132 employees participated in the bonus.

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Procter & Gamble Company

VIRTUAL "GRANDDADDY of 'em all" is the Procter & Gamble plan. And it had its beginnings in the labor unrest of 1886.

Col. William Cooper Procter, initiator of the program, emphasized its incentive features in the early stages. This was well, perhaps, for it enabled Col. Procter to say, in 1894, that despite large payments in shared profits the company's labor costs were just 62 per cent of what they had been in 1886 while unit costs had remained generally level. This vindicated the idea practically and enabled the company to go forward with the oldest continuously successful large-scale plan of its kind in the country.

Ninety-seven and five-tenths per cent of those eligible for participation in the plan shared in P & G's 1938 profits. All hourly employees earning less than $3,000 a year are eligible after 12 months' service. The employees' earnings and length of participation in the plan governed the apportionment as follows: 1 to 2 years, 5 per cent; 3 to 4 years, 6 per cent; 5 to 6 years, 7 per cent; 7 to 9 years, 8 per cent; 10 to 12 years, 10 per cent; 13 to 15 years, 12 per cent; after 15 years, 15 per cent.

Basically, the P & G plan combines profit sharing with stock ownership. For the first six years the employee

devotes his share to the purchase of stock and his dividends to the purchase of additional stock. After that he collects cash dividends in the proportions stated above. After the 6-year period he may continue to buy stock if he so desires.

For many years, however, the management's main preoccupation has been the stabilization of employment, in which it has succeeded to an unrivaled degree. The average employment of its wage earners, over the 11-year period ending in 1938, was 50 weeks a year. And the labor turnover, naturally, was reduced to less than ½ of 1 per cent.

The profit-sharing policy is soundly buttressed by pension and disability benefits. The stock issued to employees is strongly underwritten to prevent loss. The company guarantees that, should the employee leave the company, the stock purchased by him over the 6-year period shall not be less than the total of his own payments on the stock plus interest at 6 per cent. But few, indeed, do leave the company.

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General Electric

IN 1937, a good year, 64,000 of General Electric's 75,000 employees received $5,800,000 in general profit sharing. This sum, in accordance with the plan authorized by the stockholders, represented 12½ per cent of net profits after 8 per cent had been earned on the book value of the common stock.

The recipients included all employees, except management men receiving extra compensation, who had worked one or more consecutive years for the company. Five-year (and up) employees got full shares; 3 to 5-year employees, two-thirds; 1 to 3-year employees, one-third.

At the time of writing, the exact earnings for 1938 under the general profit sharing plan had not been announced, but President Gerard Swope recently told the Vandenberg Senate Subcommittee that the Company's payment for 1938, if any, would be small in amount.

GE employees understand fully, however, that profits are shared *only* when profits are made. This testifies to the flexibility of the company's present plan. In earlier years, beginning in 1916, GE paid a flat 5 per cent above wages to 5-year employees. The defect of this plan proved to be that payments did not depend upon or vary with profits. The present plan was adopted in 1934.

In the period from 1916 through 1937, the company has paid out approximately $100,000,000 as total profit sharing.

At the close of 1937, $28,000,000 of GE Employees Securities Corporation bonds were held by almost 30,000 employees, and $11,000,000 of such bonds were held by the Additional Pension Trust for upwards of 56,000 employees, or a total of $39,000,000. In addition, savings of employees receiving extra compensation amounted to over $15,000,000, so that total savings of employees at the end of 1937 amounted to about $54,000,000, compared with the $100,000,000 distributed as profit sharing. These savings of course, are in addition to any outside investments the employees may have made.

Backing up GE's profit-sharing plans is a well-rounded social security program, which has included contributory pensions since 1912; contributory life insurance, since 1920; savings, since 1922; home ownership, since 1924. And in 1936 a plan was adopted to adjust income of employees to changes in cost of living. The employees were offered a contributory unemployment benefit plan in 1925 which was accepted in 1930, after which time the plan provided aid in case of unemployment until it was superseded in 1936 by the Federal Social Security Act. A contributory plan for relief and loans in emergencies was also started in 1930 and still carries on some of the functions formerly included under the unemployment benefit plan.

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The ILG Electric Ventilating Company

THANKS TO PROFIT SHARING, 202 employees of the Ilg Electric Ventilating Company of Chicago are also stockholders. Since 1909, when the Ilg plan was instituted, the company has considered the employee's time and effort as an "investment" on his part.

There is no fixed basis for alloting the return other than the company's commitment to share the profits when the profits are earned. The Board of Directors annually determines what proportion of the company's earnings shall be shared, and these are paid in proportion to the employees' earnings and service.

Payment is made in certificates of deposit, bearing interest at 5 per cent. These may be cashed 14 months after issuance and, from time to time, applied to the purchase of Ilg common stock.

Last year all 306 Ilg employees participated. Since only those of three years' service are eligible, it may be seen that turnover has ceased to be a problem for the company or a worry to the wage earners.

In the last 30 years, the company has paid out $658,000 in shared profits.

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Westinghouse Electric & Manufacturing Company

WESTINGHOUSE EMPLOYEES keep a keen eye trained on the profit-and-loss statement. For their income varies from month to month in accordance with the company's fortunes of the previous three months.

The Westinghouse plan went into effect on May 1, 1936, and all 41,490 employees, both hourly and salaried, began to participate immediately regardless of length of service.

It works this way. When average net income for any three consecutive months is $600,000, salaries are at the community rates for similar type of work in that community. Five days is the basic work week. Since May 1, 1936, employees' incomes have risen and fallen with the company's profits. The average monthly net income for three months is totaled, and from it $600,000 is deducted. Then if profits exceed the $600,000 by a given amount, say $93,000, 1 per cent of the average base payroll is added. The base has been modified, of course, in keeping with payroll changes occurring since May 1936.

A substantial increase in profit is reflected immediately, therefore, in cash in the employee's pay envelope. Conversely, the income of salaried employees receiving more than $125 a month is subject to a 1 per cent reduction whenever the company's income falls below the $600,000 average by as much as the governing unit of, let us again say, $93,000.

The successful establishment of a plan so unique is witness to the complete confidence which Westinghouse has won from its employees through years of fair treatment and generous attention to every detail affecting the wage earner's welfare. An example is the relief fund which provides benefits of 26 weeks for the disability of employees with less than 5 years of service. The company's pension, savings, group insurance, and educational programs are among the most advanced in industry.

Monsanto Tells Ownership Story

PUBLIC RELATIONS

Industry's Biggest Job

CHALLENGED by the charge that American industry is owned by an octopus called "the sixty families," Monsanto Chemical Company of St. Louis has placed its cards face up on the table for Mr. and Mrs. America to see.

Boldly digging into its own stock-ownership records, withholding no facts, Monsanto made public a detailed analysis of its findings. Neither very big, nor very small, Monsanto is a company that can be taken as entirely typical of a large section of industry. The survey showed:

1. That Monsanto's owners are not a few mysterious plutocrats but thousands of just plain people (1,291,816 shares are held by 10,170 stockholders).

2. That scores of universities, hospitals and charitable and educational institutions and hundreds of widows and orphans are shareholders.

3. That millions of other Americans have an indirect interest in Monsanto's welfare as investors in investment trusts and policyholders in life and fire insurance companies which, in turn, own Monsanto stock.

Of the 10,170 stockholders, 7,604 are individuals; 3,890 are men—farmers, doctors, lawyers, storekeepers, dentists, salesmen, engineers, insurance agents, real estate men and the like; 3,714 are women—maids, wives, and widows, teachers, secretaries, typists, clerks, and so forth. Few are what we might call wealthy.

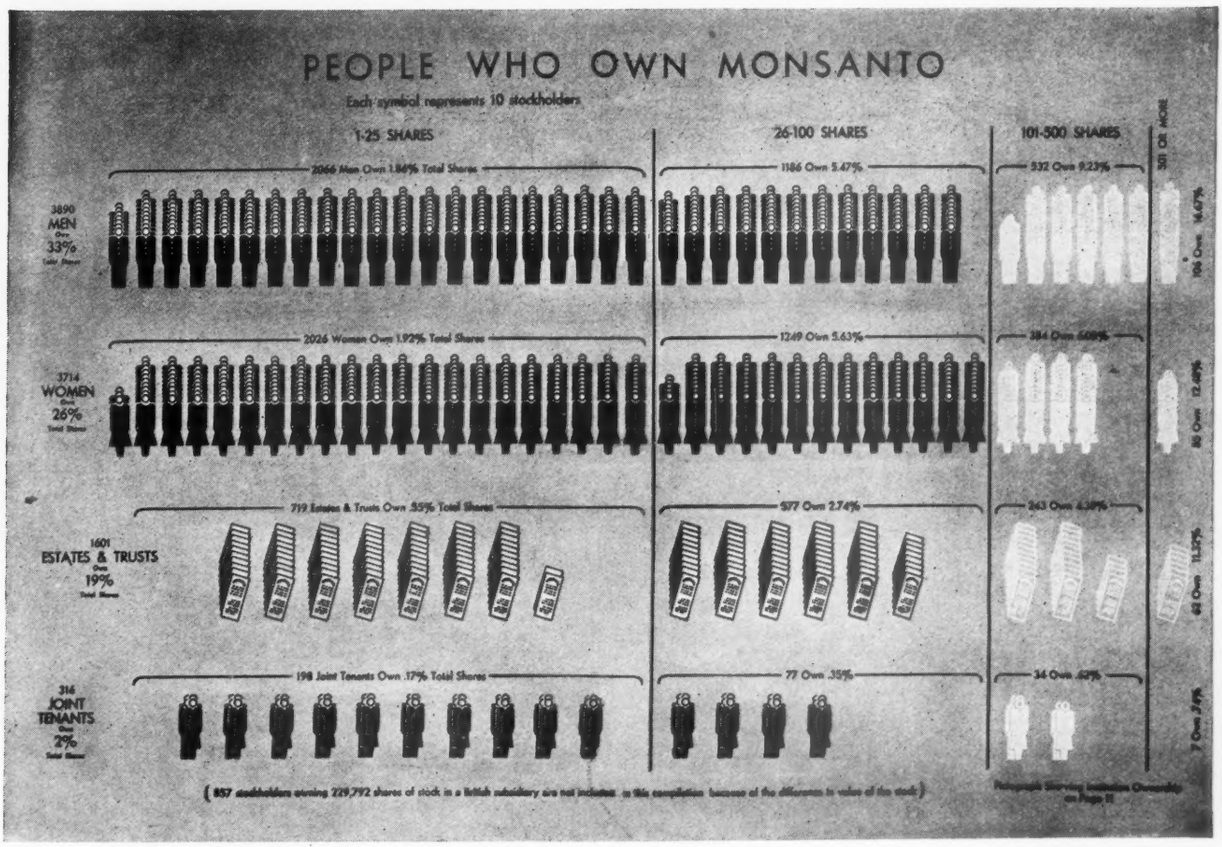
Many of these people are among Monsanto's 6,100 employees.

"One of them," says the *Monsanto Magazine*, in a report on the survey, "is our president, Edgar M. Queeny. . . . To the casual observer, it might be assumed that the president of a company owns it . . . Yet, in Monsanto as in most other companies, the president is no more the sole owner than is the President of the United States the sole owner of the country he administers. . . Mr. Queeny does own a substantial block of stock. Yet . . . the total shares he directly or indirectly controls amount to less than eight per cent of all stock outstanding."

To dramatize the story, *Monsanto Magazine* sent editors and photographers to Cincinnati (where the company has no plants or laboratories) to get acquainted with some of its typical stockholders. The picture of "Spuds" Crossett, a Cincinnati produce merchant, on the magazine's cover introduces the reader to dozens of similar workaday folk on the inside pages.

Monsanto executives have expressed the hope that other companies will follow up with a similar public relations job and thus help dispel a fallacy that has often been used in attacks upon industry.

You'll see at once, when you scan this vivid pictograph from Monsanto Magazine, that here is no "closed corporation"



INDUSTRY and the

THE HONORABLE LOUIS JOHNSON

Assistant Secretary of War

AIRCRAFT AND ORDNANCE come to the fore, as properly they should, among the military expenditures outlined in the President's recent message on national defense.

Subject to such readjustments as may be made necessary by the suddenly shifting aspects of international affairs, the new program should come close to meeting what now appear to be the minimum defense requirements set forth in our carefully considered recommendations.

It is interesting to note that the Army devoted only 12.7 per cent of its total funds to the air arm in 1926, compared with 28.9 per cent in 1938. The proposed new increase will carry the proportion much higher. Whether this will keep the United States among the elite in air strength it would be difficult, at this time, to say. But our air force will be greatly strengthened and I believe we will retain our preeminence in aeronautical research and development.

Most of us are familiar with the strategic basis of our defense plans. First, we need a swift, effective air fleet ready to meet any sudden attack on our borders. Supporting this is a trained Initial Protective Force of 400,000 in mobile, well-equipped units. Sufficient men, munitions, fortifications and air units must be maintained to protect our Possessions. Beyond our frontiers, of course, the Navy forms the first line of defense.

It is my aim in this article, therefore, to discuss the President's message, and the appropriations which Congress will be asked to make, in the light of their implications to industry. For industry will not only play a vital role in time of war but its continued great co-operation in time of peace is increasingly essential to a well-rounded defense policy. Thus I welcome this opportunity to comment on the developments in our industrial mobilization plans occurring since "Industry and the Next War" appeared in the May, 1938, issue of *Factory*.

One point in the President's message can not be emphasized too often. I quote from it: ". . . while other armies were conducting the actual figting, the United States had more than a year of absolute peace at home without any threat of attack . . . to train men, to produce raw materials, to process them into munitions and supplies and to forge the whole into fighting forces."

We needed every one of those twelve months—and more. I doubt that fate would grant us such a preparation period another time.

The President's message recommends the appropriation of $525,000,000* for new needs of the Army and Navy. This is in addition to the $1,131,000,000 already set aside for our regular military and naval uses. Some $65,000,000 of this $525,000,000 will be devoted to new needs of the Navy and $10,000,000 will be used for the very important work of training 20,000 civilian air pilots a year.

Aircraft Industry Aided

The remaining $450,000,000 is to be allocated to the Army as follows:

—$300,000,000 for an increase in the air force of approximately 3,000 planes

—$110,000,000 chiefly for equipment of the Initial Protective Force of regular Army and National Guard units

—$32,000,000 for educational orders to familiarize industry with the manufacture of "critical" items of munitions

—$8,000,000 for continental and overseas seacoast defense.

It is unlikely, however, that more than half of the $525,000,000 will be expended during the fiscal year 1940. Thus it will be seen at a glance that the new appropriations, while they represent an upward revision, are significant neither of an unwarranted increase in our military establishment nor of a sudden industrial boom.

As a matter of fact, America's 16 major aircraft producers have not been kept uniformly busy during the last five years despite the demands of commercial aviation, government air force increases, and orders from abroad. This may surprise many well-

* Above the $525,000,000 total, the Defense Message separately recommended the expenditure of an additional $27,000,000 to provide an adequate peace garrison, and housing facilities, for the augmented defenses of the Panama Canal.

THE HONORABLE LOUIS JOHNSON

(A WORD ABOUT THE AUTHOR)

Genial but forceful, Colonel Louis Johnson has given new drive to the Army's Industrial Mobilization Plan under his direction as Assistant Secretary of War.

A Past National Commander of the American Legion, Colonel Johnson saw World War service as a captain of infantry, and participated in the Meuse-Argonne offensive.

He was heavyweight boxing and wrestling champion at the University of Virginia where he took his law degree in 1912. He has long practiced law at Clarksburg, West Virginia, and at the age of twenty-six was majority floor leader and chairman of the Judiciary Committee of the West Virginia House of Delegates.

Colonel Johnson flies more than 60,000 miles a year and speaks twice a week in his increasingly successful effort to gain for the Industrial Mobilization Plan the support and understanding of industry and the public.

NEW DEFENSE PROGRAM

Aircraft and ordnance share spotlight in $212,500,000 boost. No sudden industrial boom impends. But educational orders, profitless now, will end bottlenecks and prepare industry for mass production when needed. Aggressor nations will no longer hold us lightly as Germany once did, says dynamic citizen-soldier Johnson in review of developments since Factory's "Industry and the Next War"

Official Photograph, U. S. Army Air Corps

DECKED OUT IN ITS "WAR PAINT," this Boeing B-17 bomber (Flying Fortress) is an old friend in new guise. With a speed well above 225 m.p.h., this ship carries a heavy load and a crew of 9

informed men in industry. But the fact is that the prompt expenditure of $50,000,000 for aircraft, as recommended in the defense message, is decidedly needed to stabilize employment and utilize idle plant capacity in our airplane factories. Even so, our plant capacities may not be equal to war-time production nor perhaps to a rearmament policy comparable to that pursued by other world powers. We contemplate an addition of a minimum of 3,000 planes* while the nations of Europe are known to be building or planning much larger air fleets.

The significance of the new aircraft program is not limited solely to the manufacture of planes for it will affect all the industries "surrounding" the aircraft plants. Chief of these, though not necessarily in the order named, are the makers of forgings, bearings and anti-friction bearing assemblies, sheet aluminum, steel and copper tubing, stainless steel, magnesium alloys, electrical wire and control cables, plastics, paints, varnishes, upholstery, rubber, instruments, parachute silk, machine tools, and, of course, fuel and lubricants.

There has been a pronounced tendency among the aircraft producers of late to widen even further the fanwise spread of the industries engaged in their supply. In the Los Angeles area alone, I understand, some 30 smaller shops depend at least in part on the aircraft plants.

To Create War Reserve

No announcement can be made at this time of the exact manner in which the recommended $110,000,000 appropriation for ordnance and allied needs will be disbursed. It is aimed chiefly to provide a War Reserve of the "critical" munitions for the Initial Protective Force.

The War Reserve is not to be confused with the larger expenditure which may, conceivably, be needed some day to provide a six-months' supply for the quickly recruited "First Million" of a larger army in a larger conflict. The War Reserve would merely help to take up the slack while industry makes its change-over for mass production.

Some of the $110,000,000 will, of course, be allocated to the Chemical Warfare Service, for research and the acquisition and development of gas masks, and to the Signal Corps.

But the bulk of it will go into ordnance. We need more of the three-inch anti-aircraft guns, for example, and the newly-designed anti-tank weapons are much in need of production. Our fleets of light and medium tanks and combat cars must be built up. We must acquire large stocks of the .30 calibre semi-automatic rifles much faster than the arsenals are equipped to make them. (The arsenals, which are not intended for mass production can produce only 5,000 of these rifles a year. I am hopeful that future appropriations will include some $22,000,000 needed to modernize and re-equip our arsenals. Great economies would result, I am sure, for some of the machinery in these plants is antiquated beyond belief. Of this amount $4,000,000 should be granted for the rehabilitation of Edgewood arsenal to enable the Chemical Warfare Service to speed its development of gas masks).

* The Army total of 2,320 planes recommended by the Baker Board was to have been realized in fiscal 1940. The Navy, under the Naval Expansion Bill, will have 3,000 eventually. Plus these, the Navy is to get about 500 new planes if the President's recommendations are adopted. Allowing for obsolescence, the authorized strength of our air forces will be about 8,000 planes.—Editor's note.

All these—rifles, gas masks, anti-aircraft and mobile weapons and the rest named—are "critical" items but there are many more. We need production of the .30 calibre machine gun, aircraft bombs, and more, far more, of the .37 millimeter guns for these are highly effective both for infantry and anti-aircraft. We have adapted over 2,000 of our old .75 millimeter guns with modern carriages; some 1,700 remain.

Stockpile Needed

There are, in fact, 55 "critical" items, mostly arms and ammunition. The plans for launching them on a modified scale of production take no account of the need for large reserve supplies of such things as smokeless powder, nor have we yet been able to act toward the creation of a "stockpile" of critical and strategic raw materials such as tungsten, tin, ferromanganese, and chromium.

When I speak of the comparatively moderate expenditures now contemplated for the most essential needs of a small initial field force, I sometimes wonder whether the actual magnitude of the material demands of modern warfare is generally realized. The Union Army expended 7,325 rounds of ammunition in two days at Chickamauga. At St. Mihiel, in four days, we expended 1,093,217 rounds. We know not yet what other changes may be wrought in the still unfinished century since the War Between the States. But we do know, for example, that World War rifles were of hand-operated bolt design and that modern semi-automatic rifles will discharge 30 shots a minute. One semi-automatic rifle has the fire power of seven standard rifles.

How far are our immediate production plans and present capacities from war-time needs? Here are some examples. The .50 calibre machine guns are made now by only one manufacturer. In war time the production capacity on this one weapon would have to be increased 1,500 per cent. Facilities for the manufacture of small arms and ammunition would have to be increased tenfold. Smokeless powder production would call for thirty times the present plant capacity in a major war. It would take one year, starting from scratch, to get a new smokeless powder plant into production but only seven months if the necessary blocking presses, mixing machines, macerators, etc., were available or the facilities for making them were organized.

Hails Educational Orders

Thus, you will readily see why the recommended increase of $32,000,000 for educational orders was a source of the greatest gratification to the War Department. And it should be regarded with approbation, I think, by every man in industry and every good citizen.

There has lately come to my hand an authentic report of the conference which took place between the Kaiser and his high command when Germany was still hesitating to launch the

ARMY WILL BUY many of these .30-calibre machine guns in the new defense program. Fire power and long range make this weapon effective both in infantry attack and in protecting ground units from the strafing of aircraft

Signal Corps Photo, U. S. Army

unrestricted submarine warfare which, eventually, brought America into the World War. Germany was well aware that our intervention might ensue. But her espionage had reported that we were hopelessly unprepared, industrially, to take a hand in the conflict. In fact, the Admiralty Chief used the German equivalent of the word "bottleneck" to describe our industrial situation and gave his personal guarantee to the Kaiser that no American troops would reach Europe before the war's end.

Warning to Aggressors

How nearly right was this analysis we all know. It *did* take us nearly fourteen months to place a fully equipped division of infantry on the firing line in France. And it might have taken longer without the industrial help of the Allies.

I sincerely believe that the observers of foreign powers will be tremendously impressed by our speed-up of educational orders. In my opinion, nothing has happened in recent years so perfectly calculated to convince other nations of America's military alertness. In the future, nations bent on aggrandizement will hesitate before goading us into battle.

For educational orders *will* remove bottlenecks from the course down which so much of our industrial production must flow in war time. They will save money now; later they will save lives.

Five principal considerations have governed the selection of the "critical" items which educational orders will teach industry to make. These items must be essential. They must be standard. They must be non-commercial in character. They must be required in mass quantities. And it must be shown that mass production could not be attained within a period of six months by any other means.

Bids have been asked on six of these items under last year's much smaller appropriation for Educational Orders.* The six are gas masks, recoil mechanisms for the three-inch anti-aircraft gun, searchlights, forgings of .75 millimeter shells, machining of those shells, and the semi-automatic rifle.

It is, of course, too early to say what lessons may be learned from these first orders. But I may hazard a guess that they will provide some valuable tutelage not only for industry but the War Department as well. And that is exactly what they are intended to do.

These orders are, after all, a cooperative venture, yielding no immediate profit to industry. The production resulting from them will not be large. Their chief aim is rather to bring the best thought of the Army's industrial officers and of industry's production men to bear on a common problem.

Production Studies

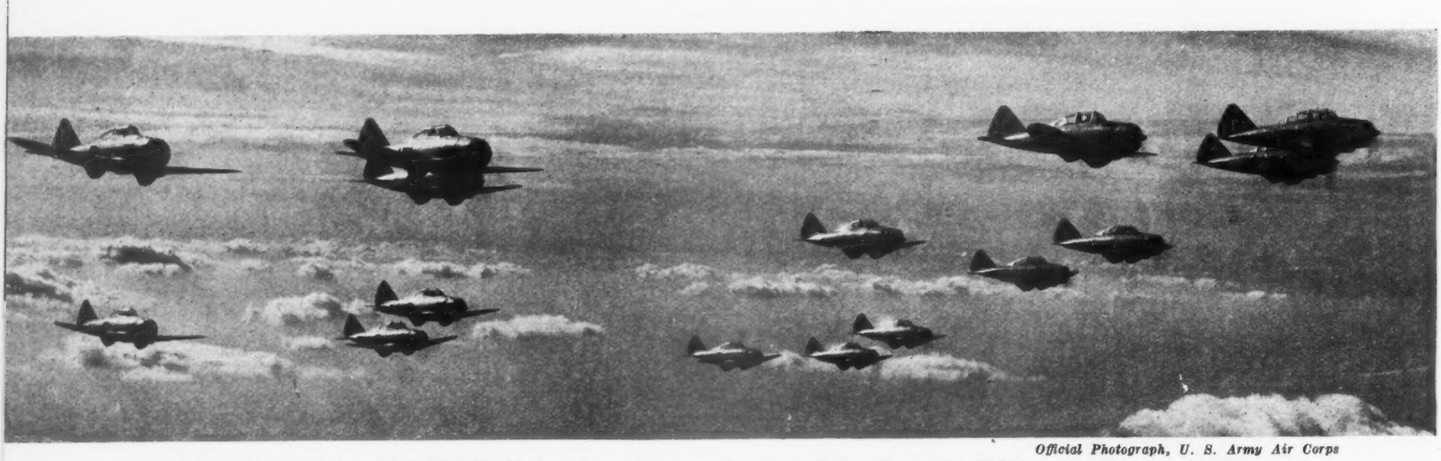
As production proceeds, the most exhaustive data will be kept by the manufacturers. When sample products are completed, the industrial officers and the plant executives will collaborate in a very thorough study of the production. They will review the design to determine its adaptability to mass production, and they will study further the tooling, the necessary conversion steps, the changes in power load, the amount of skilled personnel needed, and the time required for the various operations. In this, of course, they will have the guidance of the "using arm," the branch of the service for which the item is intended. Tests will be made of the item in use and this, in turn, may necessitate some revision of specifications and drawings.

At the completion of the educational orders (at which time, incidentally, the tooling developed in the course of production will revert to the possession of the Army) the War Department will have attained the five objectives of industrial planning:

1. Testing of specifications
2. Mass production designs
3. A production study showing methods used
4. Creation of gages, dies, jigs, tools and fixtures peculiar to the item
5. Manufacture of a sufficient number to test the method

When I say that these orders will be of mutual education to the manufacturers and the War Department, I have in mind several things which we hope to learn from them.

For one thing, they will undoubtedly make necessary some revision of the 10,000 Plant Allocations now on file in the Planning Branch. As you know, these allocations are based on studies of the war uses to which plants in the manufacturing industries can be put. For example, part of the facilities of a toy train factory



Official Photograph, U. S. Army Air Corps

STRONG OVERHEAD PROTECTION for the pilot is a feature of the Seversky P-35, a speedy pursuit ship

* Last year, Congress appropriated $10,000,000 to be spent at $2,000,000 a year over a five-year period. A new bill, H.R. 1004, has already been introduced by Rep. Smith of Connecticut to amend the earlier measure with an additional $35,000,000. It seems likely that this bill will be adopted in substance. Industry should support it.—Editor's Note.

would be converted to the manufacture of gas mask parts. A cotton textile plant would make duck for tents, a steel safe manufacturer would make submarine mines, a corset factory would make cartridge belts, and so forth. But this applies only in time of war.

Will Reveal Duplications

The educational orders themselves will go to some 250 key industrial plants most of which are already experienced in munitions manufacture. But while these plants will be the prime contractors in negotiations with the War Department, they will involve a great many other plants supplying them with parts, raw materials, and certain completed units such as airplane generators.

Naturally, the War Department is fully as interested in the data regarding these secondary producers as it is in the operations of the prime contractors. It follows, beyond question, that we are going to discover, when all these data are assembled, that many of the firms supplying prime contractors have already been allocated for war-time conversion by the Planning Branch. The ramifications and the interlocking of our industrial structure are such that it would be absolutely impossible to uncover these duplications in any other way. And to wait for war-time exigencies to reveal them would be a time-taking and costly business indeed.

Thus the educational orders will open one vital "bottleneck" which no amount of careful planning by the ablest men in the Planning Branch could possibly conquer.

Will Test Specifications

Now there is another lesson which the War Department hopes sincerely to master in its contact with industry through educational orders. Our officers will welcome, in fact they will solicit the criticism of producers on the methods and tolerances set forth in the specifications. Why should we insist on a Class Four thread, let us say, when actual manufacturing procedure demonstrates that a Class Two thread will do the job? Or suppose,

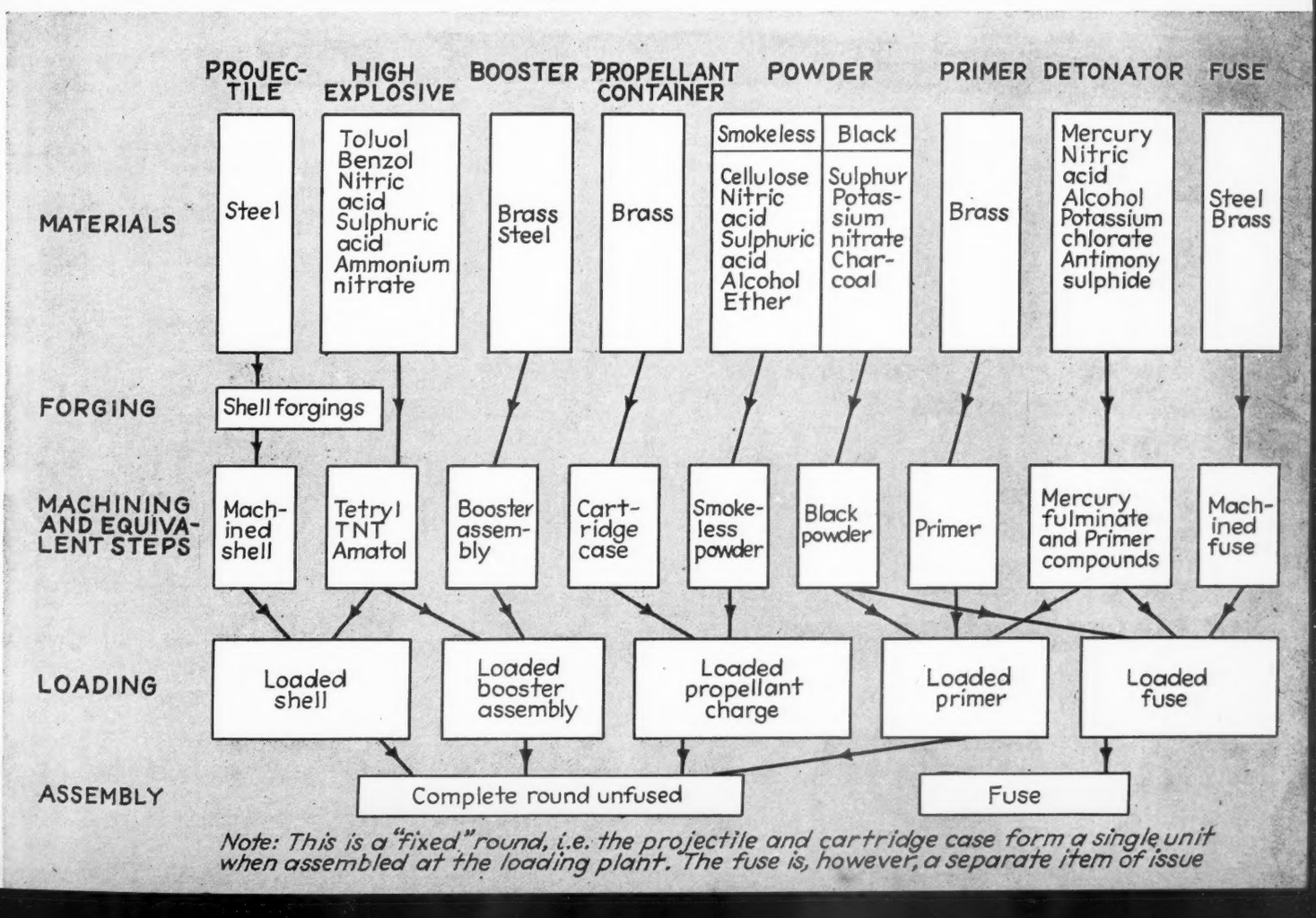
HERE ARE THE STEPS IN THE MANUFACTURE OF A "CRITICAL" ITEM

THE .75 millimetre shell is included among the "critical" munitions. From raw materials to finished shell, the chart below shows the complexity of one of the comparatively simple items on the War Department's list. Seventy-eight machines, some of special design, are needed for the production of 1,000 machined shells every eight hours. Twenty-four of the required operations consume a total of 30 minutes per shell, with no allowance for delay in the plant.

The War Department is seeking now to reduce the number of plant-to-plant transfers involved in finishing these shells, and thus simplify the transportation problem which they present. All five steps of manufacture are shown in the chart, although some might be combined in one plant.

In the World War, it took 366 days to finish these shells and load them on shipboard. The War Department now seeks a reasonable standard of attainment of 177 days, has its eye on a possible minimum of 65.

Forging of the shells is one "critical" item, machining them another. Bids will be opened soon for educational orders. Chart gives a bird's eye view of industries involved though only two prime contractors will receive contracts.



Note: This is a "fixed" round, i.e. the projectile and cartridge case form a single unit when assembled at the loading plant. The fuse is, however, a separate item of issue

WAR DEPARTMENT PROCUREMENT PLANNING DISTRICT OFFICES

Forty-nine district field offices are maintained by the seven supply arms and services of the army for the purpose of keeping in close contact with manufacturers.

These are the "outposts" of industrial mobilization planning. Through these offices, the Planning Branch of the Office of the Assistant Secretary of War carries on the plant surveys which have resulted in the allocation of 10,000 factories for possible partial conversion to war-time production.

The following list of procurement planning officers, arranged by supply arm and service, was furnished to *Factory* by the War Department. It is suggested that plant management men may wish to add this list to their reference files.

—EDITOR'S NOTE

QUARTERMASTER CORPS

Lt. Col. George Luberoff, Q.M.C.
Army Base, BOSTON, 9, Mass.

Col. Clifford L. Corbin, Q.M.C.
1st Ave. & 58th St., BROOKLYN, N. Y.
(Serving New York area)

Col. W. A. McCain, Q.M.C.
21st & Johnston Sts., PHILADELPHIA, Pa.

Maj. Rufus Boylan, Q.M.C.
500 Ten Forsyth St. Bldg., ATLANTA, Ga.

Lt. Col. Drury K. Mitchell, Q.M.C.
10th St. & Meigs Ave., JEFFERSONVILLE, Ind.

Lt. Col. Henry B. Barry, Q.M.C.
1819 W. Pershing Rd., CHICAGO, Ill.

Maj. Clarence J. Blake, Q.M.C.
Second & Arsenal St., ST. LOUIS, Mo.

Maj. Patrick Kelly
Normovle Q.M. Depot, (MT) SAN ANTONIO, Tex.

Lt. Col. Frank J. Riley, Q.M.C.
Fort Mason, SAN FRANCISCO, Cal.

Capt. Clarence E. Jones, Q.M.C.
Motor procurement planning,
611 Federal Bldg., DETROIT, Mich.

ORDNANCE DEPARTMENT

Maj. J. S. Crawford, O.D.
2004 P.O. & Court House Bldg., BOSTON, Mass.

Col. Robert Sears, O.D.
Springfield Armory, SPRINGFIELD, Mass.

Lt. Col. John K. Clement, O.D.
39 Whitehall St., NEW YORK, N. Y.

Maj. Roy L. Bowlin, O.D.
1118 Mercantile Bldg., ROCHESTER, N. Y.

Maj. W. C. Hamilton, O.D.
106 U.S. Custom House, PHILADELPHIA, Pa.

Capt. J. P. Harris, O.D.
Wilmington Office, Philadelphia District Nemours Bldg., WILMINGTON, Del.

Maj. C. H. Morgan, O.D.
1046 New Federal Bldg., PITTSBURGH, Pa.

Lt. Col. Philip G. Blackmore, O.D.
1524 Keith Bldg., CLEVELAND, O.

Maj. Fred A. McMahon, O.D.
623 Transportation Bldg., CINCINNATI, O.

Maj. W. F. Vander Hyden, O.D.
250 Federal Bldg., BIRMINGHAM, Ala.

Maj. Richard Z. Crane, O.D.
611 Federal Bldg., DETROIT, Mich.

Lt. Col. A. B. Johnson, O.D.
1117 New Post Office Bldg., CHICAGO, Ill.

Maj. H. M. Reedall, O.D.
952 U. S. Court House & Custom House, ST LOUIS, Mo.

Maj. Wm. I. Wilson, O.D.
118 Federal Office Bldg., SAN FRANCISCO, Cal.

AIR CORPS

Capt. Edmund C. Langmead, A.C.
65 Franklin St., BUFFALO, N. Y.

Maj. Charles Wm. Steinmetz, A.C.
1115 Post Office Bldg., CHICAGO, Ill.

Maj. James F. Powell, A.C.
1725 N.B.C. Bldg., 815 Superior Ave., CLEVELAND, O.

Maj. Alonzo M. Drake, A.C.
611 Federal Bldg., DETROIT, Mich.

Maj. J. L. Stromme, A.C.
8th & Figueroa Bldg., Room 324, LOS ANGELES, Cal.

Col. John D. Reardon, A.C.
Room 4—15th Floor, 80 Broad St., NEW YORK, N. Y.

CORPS of ENGINEERS

Capt. F. E. Dunaway, E.E.
212 Wilson Bldg., MOBILE, Ala.

Capt. F. E. Dunaway, C.E.
1203 P.O. Bldg., CHICAGO, Ill.

Maj. P. G. Bruton, C.E.
710 Army Bldg., 39 Whitehall St., NEW YORK, N. Y.

Capt. H. S. Miller, C.E.
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Capt. P. A. Agnew, C. E.
1000 Chamber of Commerce Bldg., PITTSBURGH, Pa.

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MEDICAL DEPARTMENT

Col. J. B. Huggins, M.C. (Part time)
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1819 W. Pershing Road, CHICAGO, Ill.

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Second & Arsenal St., ST. LOUIS, Mo.

Lt. Col. S. S. Creighton, M.D. (Part time)
San Francisco Gen. Depot, The Presidio, SAN FRANCISCO, Cal.

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Maj. Lester J. Harris, Sig. C.
1st Ave. & 58th St., BROOKLYN, N. Y.

Capt. Arthur E. Mickelson, Sig. C.
1819 West Pershing Road, CHICAGO, Ill. (Also handles Birmingham, Ala.)

Maj. Robert C. Vickers, Sig. C.
Presidio of SAN FRANCISCO, Cal.

CHEMICAL WARFARE SERVICE

Lt. Col. Maurice B. Willett, C.W.S.
Room 2000, P.O. & C.H. Bldg., BOSTON, Mass.

Capt. Harry A. Kuhn, C.W.S.
Room 300, 45 Broadway, NEW YORK, N. Y.

Maj. William W. Wise, C.W.S.
1017–1016 New Federal Bldg., PITTSBURGH, Pa.

Maj. Harry R. Lebkicher, C.W.S.
1113 Post Office Bldg., CHICAGO, Ill.

Col. Ray L. Avery, C.W.S.
Room 117. Federal Office Bldg., SAN FRANCISCO, Cal.

for example, that a break occurs in the thread inside the nose of a shell. If the fuze screws home tightly and safely, our inspectors are not going to reject such a shell.

On the other hand, we will have to insist on precision engineering wherever it counts. You simply can't vary the bore of a rifle by 0.005 inch. And the parts of a rifle must be absolutely interchangeable regardless of the plant of origin. Here, frankly, I believe is a point of education for some manufacturers. Some of them may quite honestly promise precision on such operations only to discover, in practice, that they can't deliver without making many changes.

To Study Labor Supply

In the course of all this, naturally, our Planning Branch is bound to gather much valuable new data on the possible shortage of skilled labor which may confront us in time of war. With the present distribution of labor, it seems difficult to visualize such a shortage, yet war production demands are such that I doubt that any nation can claim a ready made labor supply equal to the occasion. We are engaged now in a survey of the prospective war-loads on industry which, with certain adjustments, will enable us to determine the trades in which apprentice training should be encouraged.

Educational orders will give us a chance to check these findings in the field. Meanwhile the National Youth Administration is engaged in the general grounding of young men in certain mechanical skills. In the last analysis, of course, most industries today prefer to take skilled or semi-skilled men and train them in their particular processes. Here again, educational orders will help mightily in providing training data.

A Ten-Fold Return

On all of these accounts, I think you will agree, the proposed new appropriations for educational orders will yield ten times their cost or more in industrial preparedness. Thus I trust that industry, in the splendid cooperative spirit it has already shown, will continue to support this program.

Incidentally, I should like to make clear the War Department's business reasons for planning to spread the educational orders among some 250 plants. The number might have been smaller. But we want "pilot" production—since we are not contemplating mass production at this time—over as wide a range as possible. Our policy now and for the future is to equalize the burdens of war.

On the other hand, it may be that others will ask why so *small* a number of plants is involved. Apart from the fact that the number, when you count secondary producers, will be much larger, there is another answer. Put yourself in the War Department's position for a moment. If you were about to place these all-important experimental orders you would select, I believe, the firms which can show the highest rating on experience and financial stability and which have plants adaptable to ready expansion.

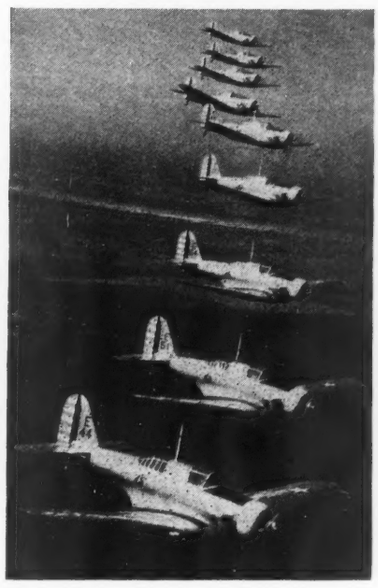
Thus, as Colonel Harry K. Rutherford, Director of the Planning Branch, has said: "Educational orders may seem to be the concern of a few plants now, but they may be the concern of *every* plant in war time." These orders today engage the facilities largely of special munitions producers and of the basic industries which supply them; but they are developing the pilot machinery and methods which may tomorrow be used in your plant.

Praises Staff

Finally, I should like to speak with all possible praise for the efficiency, integrity, and capability of the officers of the Planning Branch. In this, I may perhaps correct a not unnatural misconception concerning the qualifications of these men. In the past, many of us may have thought of Army officers, even those in the supply and procurement branches, as men remote and aloof from the practical concerns of the industrial world. And that may have been so—in the past. Today these men are not cloistered soldiers but trained specialists schooled not only in theory but by actual contact with industry. Nearly all of them are graduates of the intensive course of the Army Industrial College. And over 100 officers of the Army today are graduates of the Harvard University School of Business Administration. Most of them have been on "the industrial front," visiting, inspecting, and in some cases even working in the plants. They have no desire to usurp the functions of management, but they do understand the problems of the man who has to meet a payroll. I doubt that you will find keener judges of industrial matters anywhere in civil life. Nor men with whom confidential information may be reposed more safely.

WINNER of the Columbian Trophy, the Third Attack Group flies the Northrop A-17-A

Photograph by U. S. Army Air Corps



To Consolidate Personnel

If the increased educational orders program is adopted by Congress, it will open the way to a new objective. Our next aim is to consolidate the personnel of the Planning Branch along its present excellent lines. As you know, Army regulations require the periodic transfer of officers from post to post. The wisdom of this, in the training of fighting forces, is obvious, but I believe that some way should be found to keep the trained officers of the Planning Branch where they are. Their experience, their intimate knowledge of the Branch's problems are valuable assets which should not be diffused.

Once assured that the educational orders program will give us the opportunity we need to go ahead with this work, I intend to address myself with all the vigor at my command to the task of keeping these men at their present posts to the maximum extent compatible with fairness to the officers themselves and to the service.

For Your Reference

In conclusion, I invite your attention to the list of district procurement planning officers of the War Department which accompanies this article. Many plant managers may wish to add to their reference files this list of the men in the "outposts" of industrial mobilization planning. It is their duty to study industry's peace-time production and arrange the allocation of plant facilities for possible wartime production.

More for the Company, More for the Girls

Work simplification cuts number of operations, boosts production, fattens pay envelopes at Maiden Form. Here's how a typical problem was worked out

J. J. BAER

Industrial Engineer
Maiden Form Brassiere Company, Inc.
Bayonne, N. J.

The Author

It was cold and blustery outside the Maiden Form plant. And the light was fading fast. But the Leica caught Jim Baer with his characteristic smile. Baer went to Franklin & Marshall, finished up at Columbia. Has been in industry for 10 years, specializing in time and motion study, layout, foreman and operator training, production control, and cost reduction work. Was previously with Walter Kidde Co., Cutler-Hammer, Aero-Vox Wireless, Polymet, Inc., Loose Wiles Baking Corp., and B. Dickson & Co. For four years he has been associated with Allan H. Mogensen in work simplification programs, first at Eagle Pencil and now at Maiden Form. His hobbies are golf, which many of his friends think he should give up, and skeet, where he gets back what he loses on the putting green. Also collects first editions of books of travel.

HAVE YOU HEARD how the brassiere business is booming? Does it look like a good one to get into? Are you thinking this article will tell you how and why to make this so indispensable piece of feminine apparel? Then here is as good a place as any for you to stop.

Yes, it all happened in a brassiere factory. Yes, those dainty garments the girls in the photographs are working on happen to be brassieres. But they could have been any other piece of apparel from panties to men's shirts to overalls—and the principles applied here can be applied equally well to the manufacture of cookies or lead pencils. I know because those are two of the dozen industries in which I have applied them.

So let me tell you, not the secrets of the brassiere or the cookie or the lead pencil business, but something about the more fundamental job of helping wage earners make more brassieres—or more cookies or more pencils—with no more physical effort on their part, but to the pleasant crackle of many another dollar bill in the pay envelope. For here, in this clipping operation I am about to describe, is one of those simple problems in work simplification whose solution is invariably profitable to employer and employee alike.

What does the company get? In this case, an increase in production—more brassieres at lower unit cost.

What do the girls get? A 25 per cent raise in wages for standard production—just that many more dollars at the end of the week to spend for brassieres and stockings and groceries and rent.

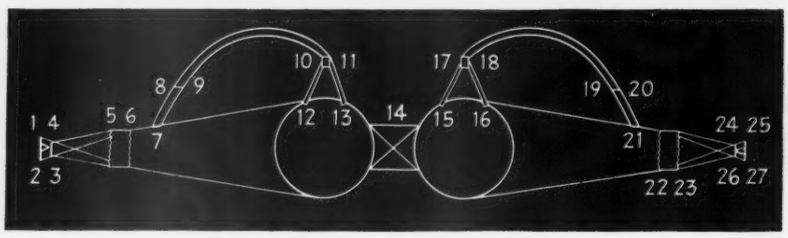
But that *does* begin to get down to fundamentals, and all I want to do here is tell how we, in our major task of setting standards and installing a bonus plan throughout the Maiden Form plant, improved a single detail of brassiere manufacture.

Here's the picture. Clipping is the job of cutting off the tiny ends of thread that are left every time a sewing operation is completed. On the simplest Maiden Form brassiere there are 13 of these ends; on the more elaborate styles, as high as 35. The average is about 28.

Now that may not sound like much of a job, but it takes from 30 to 40 girls to do it.

It took only one look at this department—just as it takes only one look at the photograph of the old method—to learn that here was a spot that needed attention.

Look at the picture for a moment. The girl sits on an ordinary wooden chair all hunched up over her work. She holds the brassieres in her lap.



To assist in the training work, instruction sheets were made for every one of Maiden Form's 250-odd styles. Each sheet contains a diagram like this one showing the location of the ends that must be clipped. It was on this style with 27 ends to be clipped that the charts described in the text were made

She has a small pair of shears in her right hand. The left hand does little but hold. The position is fatiguing. The cut threads get all over the girl, the brassieres, and the floor.

First step, accordingly, was to make a right-and-left-hand process chart of the old method, showing the more obvious motions.

Now it is impossible to reproduce that chart on this page, for the simple reason that it is close to 5 feet long. Suffice it to say that it is an almost endless repetition of a very simple cycle in which the right hand after clipping moved to the next point to pre-position. The left hand then released and moved to that point to hold and position, whereupon the right hand released and then clipped. This transferring from hand to hand went on and on, the number of transfers pending of course on number of ends.

The chart was made on a garment with 27 ends to be clipped. Their location is shown in the figure. To clip those 27 ends the left hand performed 39 operations, about half of them holding, and 19 transportations. At the same time the right hand was performing 55 operations, some of them holding, and 33 transportations.

Now here was a case where enough girls were doing the same job to warrant a micromotion analysis. So we filmed the operation, made the analysis, and from the results of what the old chart and the micromotion study showed, worked up a new chart.

We then selected a girl to train—not the fastest girl in the department, but just an average worker. We told her we were experimenting. Maybe with her help we could work out a better way to do this job. Maybe it would be a complete fizzle. We said we thought it meant the girls could do more brassieres and make more money without working any harder.

Next we designed a workplace. We knew it was wrong for the girl to hold the work in her lap. We knew a table was needed, also a re-

(Continued on page 114)

Maiden Form makes so many brassiers that it takes from 30 to 40 girls to clip the short ends of threads that are left every time a stitching operation is completed. Above is the old way. The girls sat all hunched up over their work. Both hands did lots of holding, the left hand little else but. The position was, to put it mildly, fatiguing. The scissors are held in, and are practically obscured by the girl's right hand

This is the way the clipping job is now set up. The operator sits naturally in a posture chair. There are sponge rubber pads to rest her elbows on. All work is done with in the normal working area. Simple spring clips hold the brassiere in position, leaving the hands free, especially the left one, for useful work. The ends fall into a chute instead of on the floor. Arrow points to pre-positioned tape on which the girl piles the clipped brassieres, and which she uses to tie the lot into a bundle when her work is done

After All — EMPLOYEES

Elementary? Yes. Ralph Lind wanted it that way and so did we, it being our firm belief and his that the closer we all stick to fundamentals, the sooner we may hope to reach an employer-employee understanding that guarantees industrial peace.

EVERY EMPLOYER must have a labor policy of some kind. In small industrial units, where "the boss" is in constant personal touch with his employees, it need not be elaborate, it may not be formally set down, but in every business where men or women are employed, there must be some understanding of the relationship that is to exist between management and workers, and decisions must be made concerning the principles that will guide that relationship.

In all the welter of argument, dispute, disturbances, strikes, and conflict, it is easy to forget that in a large number of concerns labor and management are on good terms and are working well toegther. Where this situation exists, it probably is because management has secured and held worker respect, confidence, and loyalty. From my experience, I would therefore suggest some simple principles that may usually be relied upon to create that kind of situation, although I do not claim that, in every case, such principles of labor relations will insure such a result.

Wage Earners Are Honest

The important fact to understand is that *the great majority of American wage earners are fair and honest and that they respond satisfactorily to fair and honest treatment by the employer.*

Many workers were rudely shocked and disturbed by what happened during the recent sad depression years, when competent and willing workers were unable to work and provide for themselves and their families. It is not strange if many of them have turned to government and to labor organization in the hope that they could thus secure continuous work, better pay, and some control over the conditions of employment. Nor is it strange, under the circumstances, that a large number of workers have become inoculated with a germ of discontent and unrest, so that temporarily they see employers only as enemies, and listen to the promises of those who seem to be fighting their fight.

Both the employer and the employee have been confused and misled by a flood of propaganda, false ideas, and bad advice. Only through a sincere effort at understanding how their personal interests may best be safeguarded can the fog of false ideas be cleared away. There are many evidences that we are beginning to penetrate that fog.

A permanent solution of the labor problem, which will be satisfactory both to employer and employed, will be found when capital and labor realize that they both are necessary parts of a joint endeavor, whose success is of mutual interest and will bring satisfactory rewards to both. There must be a sense of unity in a joint enterprise, to which each group is making an equally important contribution.

One very important change of the past ten years has been the realization by employers that a well-intentioned but usually a rather condescending consideration for the welfare of employees, is not a satisfactory relationship, and that straightforward man-to-man dealing, with a recognition of rights and responsibilities on both sides, is a necessary basis for mutual respect and mutual enthusiasm and effort.

The relationship of management to its employees should be much the same as its relation to its customers. There must be a satisfactory product, fair dealing, good service, and a constant regard for the interests and welfare both of the customers and the employees. It is a selling job, whose object is to secure and hold loyalties and support.

Management has done a good job of selling customers, but a poor job of selling employees. It is now necessary to realize that employees must be sold to the same extent that customers must be sold, and to plan to do that job in a thorough and permanent way. Neither all customers, nor all employees, of course, will stay sold without continuing effort. Therefore any program for securing employee cooperation and good will should provide for a continuing effort to prevent any change in that attitude.

As a first step in deciding upon a labor policy, management should honestly analyze its conception of the kind of policy which should satisfy a workman in the particular enterprise. The next requirement is to abandon the idea, if management has it, that relations with the employees is a matter for the boss alone to decide. That attitude will no longer work. If cooperation from employees is wanted, management must understand what cooperation means, and invite it on a basis of equal rights and joint interest, rather than demand it as a rightful return for wages paid.

The Basic Problem

Obviously, the predominant interest of those who own or operate a business is to make it successful, which means in the end to make it yield a profit. The predominant interest of employees naturally is to secure in return for their effort an income that is dependable and as large as possible. They also want some recognition of personal worth and some standing as responsible persons. The basic problem of labor relations is successfully to combine these two interests and desires. If they are not fused and made to work in a truly cooperative manner, friction and some degree of productive inefficiency are inevitable.

First and most important requirement for securing employee cooperation is to fashion relations with employees so as to convince them that they are offered, in the long run, a more satisfactory return for their effort and their loyalty than they can secure in any other way.

The greatest need of American industry is to secure that degree of worker and managerial efficiency which will permit of a production cost low enough to offset the higher wage level and the shorter hours that prevail in this country in comparison with other countries, and to permit of selling prices that are low enough to

S ARE JUST PEOPLE

insure a continuously expanding volume of demand for our products. Unless we can secure this result, we shall be shut out of home and world markets, and have permanently large scale unemployment and a lower living standard than we have had.

A plan of industrial relations, however sound it is, will fail if it is administered by those who, because of temperament or lack of proper training, cannot secure and hold employee confidence and respect, without sacrificing necessary managerial control where such control is necessary.

For Full Cooperation

Before trying to decide upon the details of a policy, employees must be prepared for the acceptance of the prospective program, and should be invited to assist in deciding upon its principles and its details. We are all so constituted that we do best what we ourselves plan and approve. Our attitude is instinctively a cooperative one when we are asked to express our desires and give our advice.

It was because this fact was recognized that company unions and works councils were organized. Where the spirit of true cooperation and democracy governed their operations, they produced good results and are still doing so in some companies. They failed in most cases because the spirit of domination was stronger than the spirit of cooperation.

There is a further basic fact pertaining to labor relations which management must understand if it is to have a successfully working labor policy. If maximum results are expected, the normal attitude of those who feel that they are working only for money must be changed to an attitude of interest in results. A cog in a machine—a mere number rather than a responsible individual, with no chance to increase his usefulness or reward for special effort—gives only that amount of exertion necessary to keep the job. Where the employee finds that the employer has no more interest in him than to get out of him the most work possible, it is quite natural that he lacks interest in the results of his efforts or in the welfare of his employer.

The problem for management is to provide a new and different relationship which will give the employee an incentive for throwing off the brakes and letting his enthusiasm for results have free play; and which will give the employer an incentive for aiding the employee to find satisfaction in his job.

No labor relations program should take form without first finding out what employees think of present policies and practices, and what changes they really desire.

To make this a constructive and useful effort, it is necessary that there be a careful preliminary education of employees to an understanding of the possibilities of a truly cooperative program, such as you are willing to initiate. It probably will also be necessary that management be educated so that it can understand what employees are interested in securing and how they want to be treated.

Sincere investigations along this line have disclosed that most employees want principally eight things from their jobs: (1) Security of job and income; (2) a fair wage for the work done; (3) safe, orderly, and efficient workplaces and conditions; (4) pride in the products, policies, and progress of the company for which they work; (5) reasonable working hours; (6) an understanding of the company's business in so far as their interests are concerned; (7) an opportunity to express their thoughts concerning their jobs and their relations with the business; (8) some financial security against the hazards of sickness, accident, disability, death, and old age.

Knowing these common aspirations of employees, what are the specific basic things that should be planned for and accomplished? There will be little disagreement among progressive personnel men that they should

(Continued on page 106)

RALPH A. LIND
Stevenson, Jordan & Harrison
New York

As advisor to management on labor policies and methods, Mr. Lind has had admirable preparation for his duties. After some years in construction and real estate management, he went with the National Labor Board at its inception in 1933; stayed until 1937. During that time he was on the scene in numerous labor disputes and worked out many management-labor agreements. He was the first General Chairman of the now-famous Toledo Industrial Peace Plan, and for two years was Acting Director of the Labor Board's Cincinnati office, as well as Director at Cleveland.

Twenty plant-operating men told me about their

BIGGEST JOBS FOR 1939

"What in your company is the most significant development of the past year affecting production management? What production problem—either broad policy or specific method—is most important to you now?"

The American Management Association asked these two questions of several hundred production executives in preparation for its Autumn Production Conference (New York, November 9 and 10, 1938). The response was immediate and impressive. Replies came in from all parts of the country telling us about production problems recently solved or up for solution in all types of industry, and suggesting what, in the writers' opinions, would be practical themes for discussion.

Time and facilities available made it impossible, of course, to act on all those suggestions. However, we believe that most of the ideas contained in this correspondence should not be relegated to dust-gathering "archives." They are alive and timely. They serve to indicate, moreover, the type of problems now engaging industrial management's attention.

I have therefore selected direct quotations from 20 of the replies. They are grouped here under three main headings—personnel (items 1-8), stabilization of production (items 9-13), production planning and budgetary control (items 13-20). For obvious reasons, no names are given here, but in each case the man's title and industry are appended.

Questions of personnel continue to loom large in the production field. However, despite the all-important "human equation," the returns indicate a resumption

Nation-Wide News Service

of emphasis on the production executive's bread-and-butter problem, *that of producing the best possible product at the lowest possible cost—and at a profit.*

Alvin E. Dodd

President, American Management Association

1. They're Human Beings

We believe in the necessity of humanizing production control and wage incentive plans. The employee has sometimes been time-studied, controlled, and otherwise reported on to the extent that his feelings and pride of achievement were overlooked in the constant striving for something better for the group. In our opinion, the production problem is to get a full day's work for a full day's pay, by methods that will not cause the employee to feel that he is considered a machine—*Personnel director of a Chicago company producing business systems and forms.*

2. Who Reports to Whom?

In our plant, large production groups are now divided into areas under supervisors. General foremen are appointed reporting to these supervisors, with a staff of foremen reporting in turn to the general foremen. The objective is to relieve situations where so many foremen were reporting to a superintendent that adequate supervision was physically impossible. The result so far has been a material improvement in attaining normal objectives of production—quality, cost, and delivery—*Manager of a mass-production metal-working plant.*

3. For Closer Contact

Our most encouraging achievement is the closer contact developed with the workmen. There has been a sincere attempt on the part of the management to acquaint the employees with the various phases of management.

The biggest job ahead of management is to improve the lot of the working man in so far as job security is concerned. This problem is not insurmountable, as some concerns have demonstrated; but it is going to involve a tremendous amount of work to make it anywhere near universally applicable. However, unless manage-

ment does succeed in finding a solution to the problem, the government will be stepping in to do it for us—*Eastern manufacturer of dental supplies and equipment.*

4. A Pay Check Every Week

In our opinion the biggest problem in production management is still the personnel problem. We still want to find some plan of giving the individual employee a mathematical rating for determining the order in which he should be laid off or rehired. We are also anxious to find some plan that will guarantee to all "regular" employees a certain monthly annual income. The basis of these problems appears to lie in the desirability of management's answering labor's principal demand—security and regularity of income—*General manager of a Chicago metal-working plant.*

5. A Clear-Cut Policy

I feel that the most pressing problem confronting production management today is not only to make the foreman *feel* that he is part of supervision but also to train him to *be* an effective part of supervision. Of course, a necessary parallel to this problem is a review of company policies with a view to setting them forth in written form in a clear-cut, well-organized fashion, at the same time developing policies on subjects where none now exists and where the need is indicated—*Manager of industrial relations in an Eastern refinery.*

6. Grievances Near Zero

Our most significant development has been the coordination of an old-line foreman organization with the new ideas and activities of a fairly green but very zealous Grievance Committee, under a CIO contract. The main problem has been the dissemination of just enough proper economic data to the foreman organization, or as we call it, "Plant Operating Committee," and then the dissemination of the same information to the Union Grievance Committee to carry back to their lodge. This material emphasizes prospects of sales, shipments, and operating schedules.

After this information has sunk in sufficiently to be appreciated, we have hammered away on the subject of co-operation and waste elimination. The fact that we have dropped from a top employment a year ago of 99 per cent payroll operating at 110 per cent full time has made the problem much harder. We are glad to say that "grievances" have been reduced almost to a zero point.

The most important problem ahead is the further education of our whole force to the fact that cooperation is a two-sided affair. We cannot exist without successful teamwork between management and men. As one example, there should be no class discrimination between white-collar employees and shop employees even though the militant attitude of the latter has been directed to maintaining that attitude. How we shall do it is a thing that will develop as we go along—*General superintendent of an Eastern company manufacturing steam power specialties.*

7. Foreman Attitudes

There is another item which, while it does not definitely come under the heading of production, is nevertheless important to management, because it does have a direct influence on production. I refer to the problem of developing desired attitudes on the part of the supervisory force. The success of any program depends on effective cooperation from all concerned.

To this end we shall do everything in the way of educational work. In our opinion we would be very short-sighted not to recognize the importance of this factor in the scheme of things—*Superintendent of company manufacturing printing machinery.*

ALVIN E. DODD

As chief executive of the American Management Association, Alvin E. Dodd directs an organization that exists to make possible an interchange of management information among the companies that make up American industry. He is thus in close touch with hundreds of business and industrial executives throughout the country.

He has been with the Association since 1934. He was the organizer and first head of the Distribution Department of the U. S. Chamber of Commerce. His eight years of service in that capacity were followed by a term with Sears-Roebuck as Assistant to the President, after which he became Vice-President (in charge of merchandising) of Kroger Grocery & Baking Company.

The American Management Association does no lobbying, issues no propaganda. But, by spreading the benefits of research in scientific management, it has had profound effect on the development of American industry.

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8. Listen to Suggestions

Our wage-incentive scheme is the tie that has done more to unify the employee mind in our various departments than any other development. It has quite effectively caused our foremen and employees to become waste conscious.

Our employees have also been given the privilege of expressing themselves on working conditions, waste, and general betterment. We cannot say that any of our problems have been solved. We do know that we do have a good-will crew and they are in general doing a reputable day's work—*Eastern manufacturer of photographic supplies.*

9. In a Seasonal Business

Our business is seasonal, and merchandise is manufactured far ahead of actual receipt of orders. This condition makes it quite easy for us to be caught napping. We often have three-fourths of our year's products packed before we know definitely that there is a recession, and we must then act promptly in reducing production and lowering our stock in eight public warehouses throughout the country.

It is this balancing of stock to requirements that has been our problem. We do it by keeping a closely controlled inventory record. It is based first on the possible requirements as reported by our detail salesman working for the jobber in the territory, weighed against our past experience with the way this jobber ordered against requirements, and then again by business conditions in the territory where the jobber operates—*Eastern drug manufacturer.*

10. Peaks and Valleys

Because we are located in a small town, perhaps we feel more keenly the responsibility for keeping our working force continuously employed. We believe the current trend is strongly toward the guaranteed annual wage; that neither industry as a whole nor our own enterprise can indefinitely stand periodic alternations from great prosperity to deep depression; and that therefore we must find some way to plan our development, sales, and production problems so as to even out the peaks

(Continued on page 98)

TWO-BOARD CONTROL

Small plants, like big ones, must ship on time, else get in wrong with customers. The only possible insurance against poor service is close production control — and that, to many a small-plant operator, smacks of paperwork and a couple of extra clerks. Yet here's a visible control plan, built to fit a small plant's specific problems, to be sure, but so simple in principle that practically any other small plant can put it right to work. And it won't take even one more clerk to run it

D. E. FLINCHBAUGH
Production Manager, B. M. Root Company, York, Pa.

SMALL PLANTS may enjoy more flexibility than their larger competitors, thanks to the smaller number of orders handled, but they still must get orders out within a specified time. Since many of them are confronted with a variety of work in small quantities, they must follow some production control method.

Ours is a good example of just such a small organization, and we encounter many puzzling problems. Our operations include the manufacture of a line of woodworking machinery, nearly always with special attachments to meet individual requirements; designing and building special machinery with unusual specifications; contracting for machine work and rebuilding second-hand woodworking machinery. On practically all orders, definite shipping dates are given, and it is important that they be met.

With this miscellaneous machine business, it was essential for the company to adopt a definite work program, if schedules and efficiency were to be maintained. A part of this program was to organize a control system. This system operates mainly on two control boards—an *order control board* (Figure 1) and a *process control board* (Figure 2).

When an order is received, it goes to the production manager who consults the *order control board*. From the information there he determines a shipping date. After deciding on a time he makes out individual process cards for the various operations and places them on the *process control board*.

The *order control board* gives the production manager, at a glance, a mental picture of all orders and their promised shipping dates. With the time needed for other work in mind,

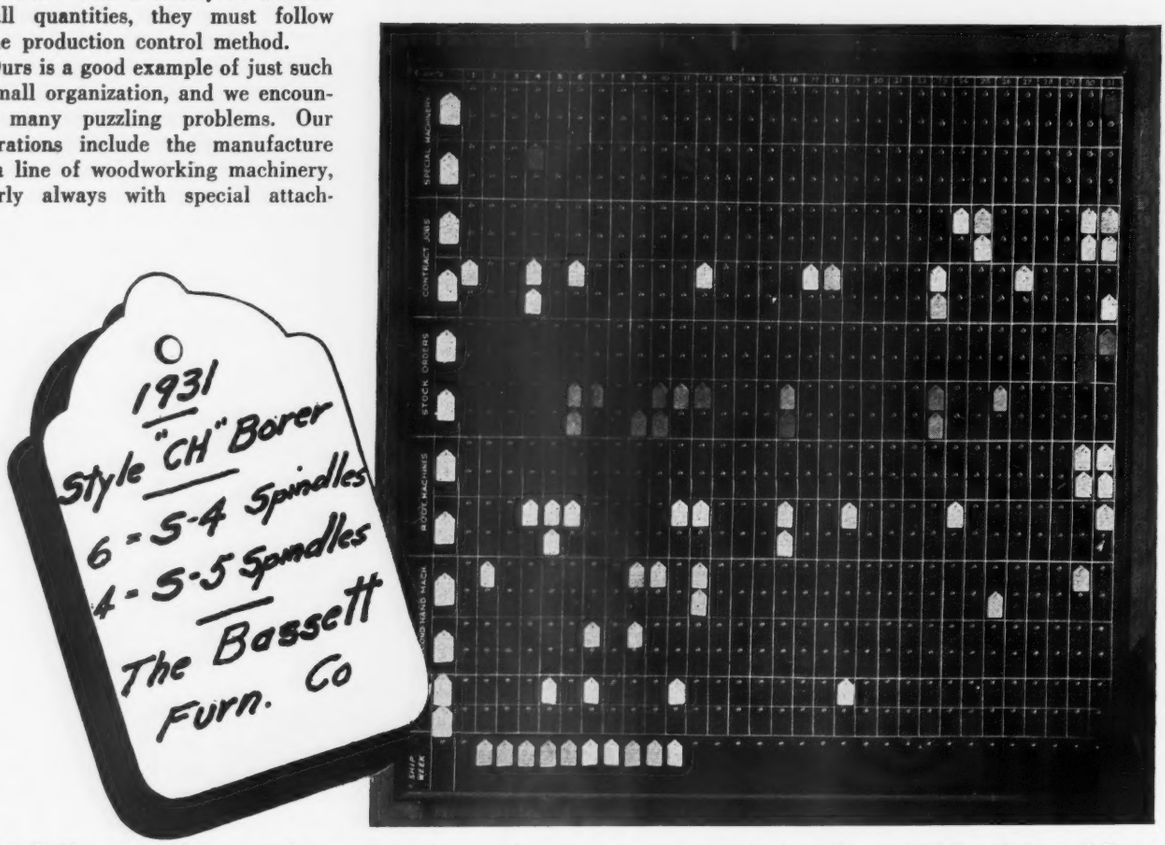


Figure 1. First step, when an order comes in, is to make out a tag and consult the order control board for a delivery date. For instance here's a tag for a standard Root machine; it goes on the board for March 16 delivery. Delivery dates can of course be set with assurance of being met because the production manager sees the complete picture, knows what machines are tied up and just how long they will continue to be tied up

Helps Small Plant Keep Promises

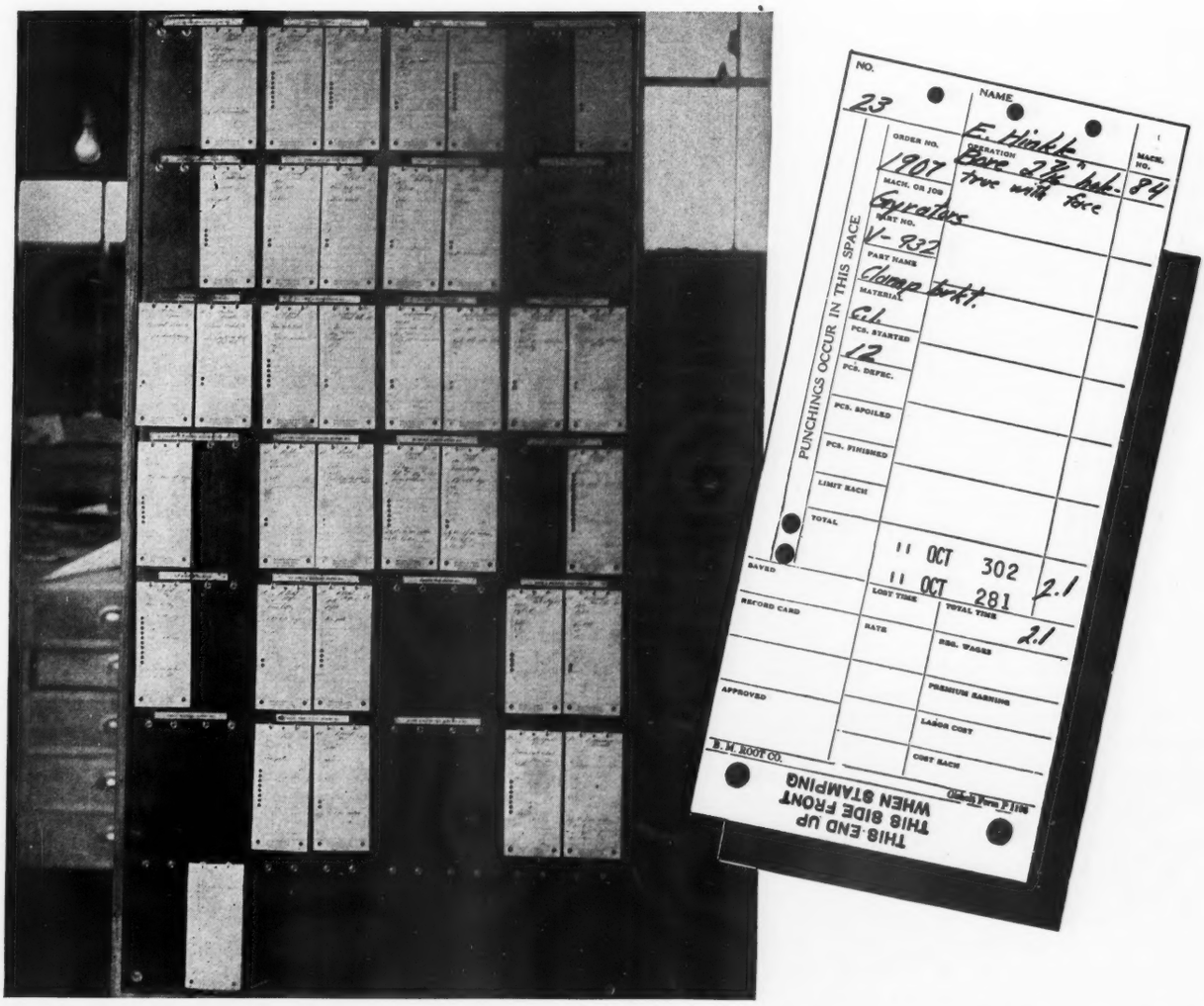


Figure 2. The process control board provides the necessary follow-up. Production cards are made for each part and hung on hooks under the name of the machine used in the work. There are two sets of hooks, one for the job the operator happens to be working on, the other for jobs ahead of him. No extra clerical help is needed

he is able to determine and promise the customer a satisfactorily accurate shipping date for the new order. The board also supplies the information he needs in order to make out his individual process cards for every item required on the order. These process cards he can place on the *process control board*, grouped with cards for similar parts that can be done at the same time with the same set-up.

Across the top of the *order control board* consecutive numbers represent days of the month, and ruled spacings run vertically to the bottom. Along the board's left-hand side each particular line of work is itemized—standard machines, special machines, contract jobs, stock orders, second-hand machines, and miscellaneous. Under each classification and each day, two spaces are provided. These two spaces represent two consecutive months, such as February and March. For each product a tag of a different color is used. For example, a red tag denotes special machines, a white one standard machines, and so forth.

How It Works

A typical illustration of operation might be this: Important information concerning an order for a standard machine is written on a white tag. This information includes such items as order number, special features, and the customer's name. The *order control board* is then consulted and studied carefully for a reasonable delivery date. When this date has been determined, the white card is placed on the hook for that date.

The *process control board* is a follow-up of the *order control board.* From the blueprints, production cards are made up for each part needed on the job. These cards are hung on the *process control board* under the label of the machine used in the work.

The *process control board* has two sets of hooks under each machine, one set for the job the man is working on, and the other for the cards of jobs ahead. Each operator finds the card for his next job, always the first one showing, at the hook, under his name.

This control system, if employed properly, provides effective scheduling in the shop of medium size.

HOW WE ORGANIZED A

BEFORE ESTABLISHING our production welding department we made a careful preliminary analysis of the engineering, cost, production, and personnel factors involved. When this investigation proved the feasibility of the step, we went ahead.

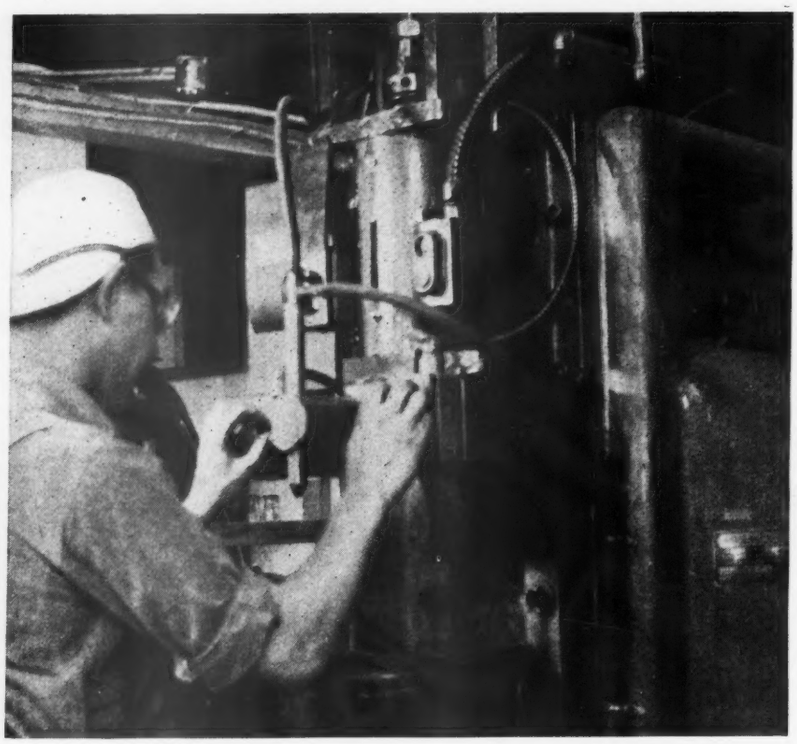
In our organization procedure we recognized a seven-part problem. Attention had to be given to: (1) Layout, (2) engineering analysis of each job, (3) selection of personnel, (4) training, (5) supervision, (6) inspection, and (7) maintenance.

1. Layout—It is doubtful whether the importance of the layout can be overemphasized. We did not arbitrarily place this department in any convenient, available space. First we considered the flow of materials, both into the department from feeder divisions, and out of the department to other processing departments. We had also to keep in mind the engineering requirements as a contributing factor in the layout, because they had a bearing on the location of equipment. A smooth flow of material within the department was wanted just as much as an orderly movement to and from it.

The location was determined ultimately from the layout drawing of the whole plant. In this way available space was clearly defined, and desirable space noted. Some compromise between the two factors of availability and desirability was necessary in order to avoid remodeling of an existing department at large expense.

2. Engineering Analysis—Next step was to attend to the engineering details. These we divided into: (a) Work to be produced, (b) construction of equipment, (c) motion and time studies, (d) safety. Our preliminary investigation had demonstrated the desirability of the department for certain production welding operations; now an analysis of all plant operations that might be done by production welding methods was considered, and if by doing them in this manner an economy could be effected, the work was added to that of the department.

We also decided what other operations, if any, should be done in this department, such as grinding and assembling. When the question of work to be done had been decided, it was necessary to design, and either purchase or manufacture, the equipment to be used. Special jigs and fixtures had to be made; torches, rods, arc-welding machines, and other equipment that had to be purchased, were chosen.



Safety is a factor always to be considered in setting up a welding department —or, for the matter of that, any factory department. Because this spot welding machine is equipped with two switches that must be tripped simultaneously, the operator cannot possibly get his hands caught beneath the plunger

In designing jigs or fixtures we met a problem not normally involved in metal fabricating equipment. Welding, whether by the torch or the arc method, develops a teriffic heat; consequently, we were faced with the task of cooling the equipment. A mechanical means of cooling was necessary since, if we were to allow the jigs or fixtures to cool by the natural process of heat dissipation into the atmosphere, we should have had to stop every few minutes.

We found many methods of overcoming this difficulty. Metals that dissipate heat rapidly, such as copper, may be used. One or more blasts of compressed air may be directed on the machine. Water-jacketed jigs may be employed.

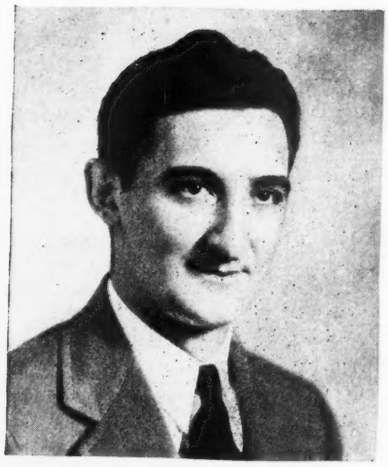
Once the equipment had been designed, built, and located, motion and time studies were made of the operations. These enabled the management to make provisions for piecework, bonus payments, or other incentive. The figures also provided a basis for standard costs.

We recognized the value of an active safety program. Welding apparatus, because of its heat-producing characteristics, requires special attention in this line. Fireproof booths were built for each arc-welding operator. Tested and approved shields were provided for each operator as well as fireproof gloves, aprons, and leggings.

3. Selection of Personnel—We were, at the start, anxious to know whether or not the proper type of employee for this work was available. This was determined by consulting the personnel office and its "available workers" file.

A good welder, like a machinist, toolmaker, or other skilled worker, takes an individual pride in his work which makes him a cautious, conscientious, and comparatively slow worker. Undoubtedly this is an excellent attitude in a job shop, but in production work the ideal is the highest

WELDING DEPARTMENT



Winner of a $100 award in the Lincoln Arc Welding Foundation contest for his paper on production welding methods used in fabricating small metal parts, the author has for three years been supervising production and maintenance welding for his company. He was formerly manager of Greensburg Welding Works where every type of welding was daily fare

With the emphasis on selection and training of personnel—by a man who believes employees should know the "why" as well as the "how" of their jobs. If you've shut your eyes to the advantages of welding because you thought it required high-priced specialists, this article will provide the openers

CHARLES F. ZAPPONE

Robertshaw Thermostat Company
Youngwood, Pa.

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possible flow of work with the best possible minimum of scrap. Untrained labor can always be secured at a lower rate than skilled labor, and when trained to do just one operation, will, with the right incentive, do it faster than the all-round performer.

Employees were selected for their ability to understand and apply instructions, for manual dexterity, good vision, and good physical equipment. Young men are, in our experience, more successful at this type of work than older employees because of a greater degree of manual dexterity and better vision. Naturally, the general qualities desirable in an employee, such as honesty, loyalty, friendliness, and fairness toward fellow-workers, are just as important in this as in any type of work. Close co-operation between the personnel department and the welding department supervisor have minimized the costly type of turnover resulting from trial of employees not suited to the work.

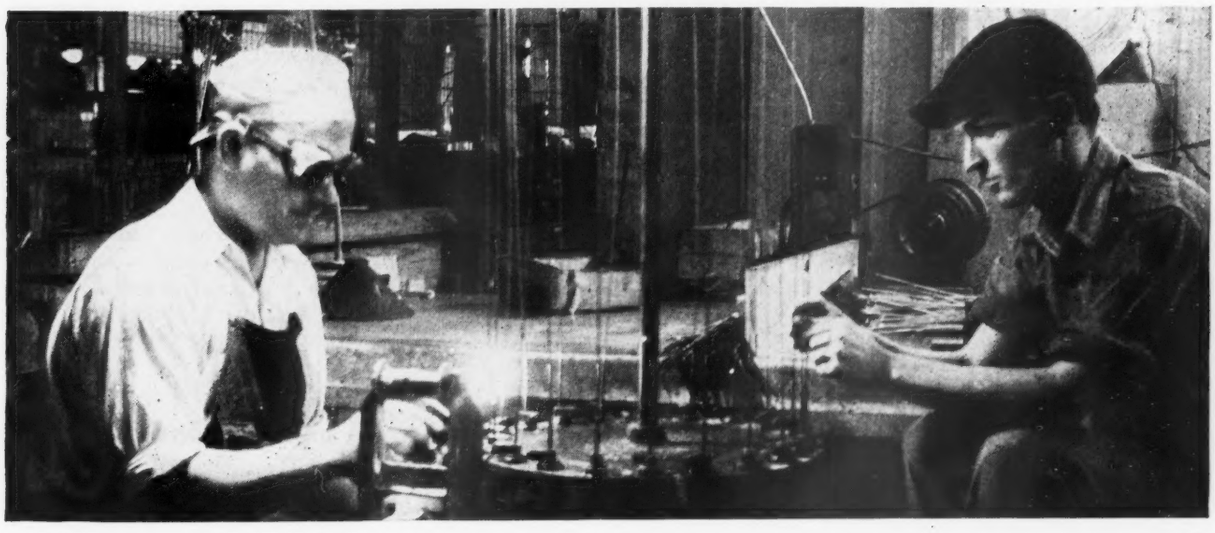
4. Training—We split up the training problem into five parts: Fundamentals and supporting information, specific instructions, practice, examination and criticism, application.

Since we believe the employee should know the "why" as well as the "how" of his work, we first explained the fundamental work and its scientific basis.

Then employees were shown, both verbally and visually, how the work fits in with that of other departments, and its effect on, and contribution to, the completed product. The various base metals, fluxes, rods, machines, and equipment used were explained.

Next came specific instructions, again both visual and verbal. For example: If copper was to be welded with a torch, it was explained that an oxidizing flame (too much oxygen) would burn the copper, causing the metal to become brittle and porous, and consequently causing an unsatisfactory product. The employee was

(Continued on page 102)



Employees were selected for ability to understand and apply instructions, for manual dexterity, good vision, good physique. Torch welding copper tubing on an automatic jig, for instance, demands nothing more than good men who can be trained for the job. Here it is a question of teamwork. Man at the right loads and unloads, man at left welds

Quick Ways to Profits

OPERATING SHORTS FOR OPERATING MEN

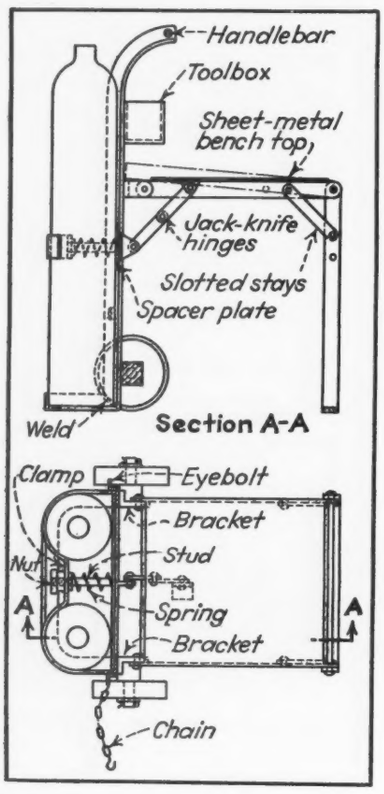
BUILDINGS AND SERVICES

Two in One—Cylinder Truck and Workbench

JOHN A. HONEGGER, *Bloomfield, N. J.*

For maintenance welding work the truck shown in the accompanying drawing is the most convenient, compact, mobile, and safest that the writer has seen. It is safe in that the tanks are rigidly fastened and cannot topple over, a dangerous occurrence as every welder knows. It is compact in that it incorporates tank storage facilities, tool storage facilities, as well as a collapsible workbench which can be erected in no time at all for doing those odd welding jobs, and then as quickly collapsed for quick transportation to another location.

The truck is made from a one-piece angle iron frame bent into an apron of proper width to hold two tanks, then bent at right angles and carried up straight to almost the height of the cylinders, where it is curved into a handle section. At the upper end a spacer bar that acts as a handlebar is fastened. Welds are made at the right-angle bends where the apron meets the uprights.

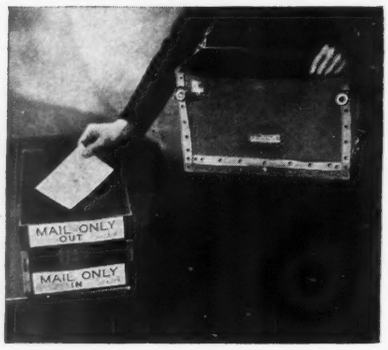


Axle and wheels are attached at such a height that when the frame stands vertical the wheels will be raised off the floor about a quarter of an inch. A spacer plate is welded to the frame about halfway up. To the front side of this plate a stud is welded, and a spring is slipped over this stud. The clamp that fits the tank contours and keeps the tanks from falling off the truck also slips over the stud. Finally, a nut turns down on the stud to secure the clamp against the tanks.

The toolbox is also welded to the frame, and holds wrenches, torches, and tips required on various jobs.

A little above the spacer plate two brackets are welded to the frame, to which is hinged the sheet metal bench top. Jack-knife hinges are mounted on pivots hinged to the bench top and spacer plate. To the outer end of the bench top the outboard U-shaped leg is hinged. This leg is normally held in the upright position by means of hinged slotted straps which are pivotally hinged to the sides of the bench.

When the truck is to be moved to a new location, the bench is collapsed by swinging the leg in a counterclockwise direction until it rests on top of the bench in the alternative position shown, and the jack-knife hinge is swung outward, causing the bench to swing downward in a clockwise direction. The chain is placed around the folded bench and hooked to the eyebolt on the other side of the frame. The chain then holds the bench assembly in place when the frame is tipped backward onto the wheels.



Card Improves Mailing Service

JOHN F. PIERCE
Director, Office Service Department
Tennessee Valley Authority

Do your letters always get mailed the same day? Have you ever come in in the morning and found an important piece of correspondence still lying in the outgoing mail tray?

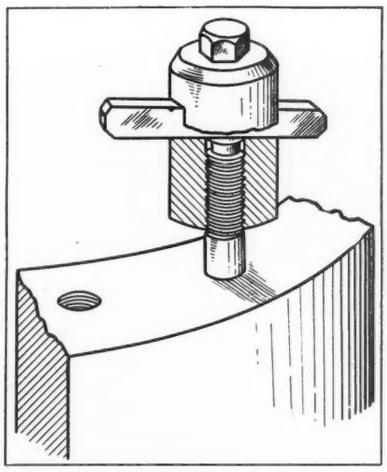
This happened so often with us that we had "Last collection has been made" printed on cards. When messengers make their last rounds, they drop one of the cards in the outgoing basket. If a letter is finished too late to make the last pick-up, it is only necessary to telephone the mail room for special service.

Fire extinguishing equipment selected with specific hazards in mind will aid in reducing damage and promoting safety. Water, for instance, may give disastrous results if used on electrical or oil fires.

Wedge-Lock-Type Stud Driver

CHAS. H. WILLEY, *Penacook, N. H.*

When setting large studs, the type of stud driver in the sketch, called a wedge-lock type, is quite the thing



for sure driving, and quick, easy release after the stud is driven home.

In making this driver it is necessary to make it for the size of stud to be driven. The body is drilled and tapped and a slot for the wedge made, and a hexagon milled on top for the wrench to grasp. A small disk is used on top of the stud. No injury to the stud is done with such a driver, and it is a thoroughly practical and useful tool.

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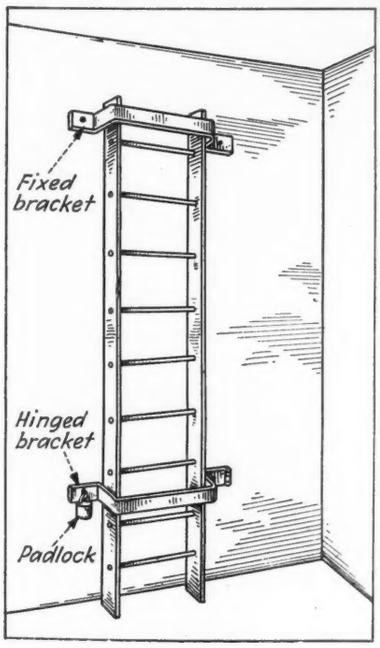
To Keep Ladders Where They're Wanted

S. H. COLEMAN, *Roanoke, Va.*

A departmental supervisor in a large plant, after suffering much grief as a result of inability to find ladders when needed, solved this problem by locking individual ladders to wall spaces near the points where they were most frequently used.

To do this, the ladder is placed in a vertical position against the wall, with its top end slipped under an iron bracket permanently bolted to the brickwork. The lower end is held flush against the surface with a similar bracket, hinged on one side, and with a hasp slot arranged to slip over a staple in the wall on the other. A lock, of the easily broken type, so that the ladder can be made available with very little effort in cases of emergency, holds the assembly in place. To remove the ladder after unlocking, its feet are moved away from the wall until the upper end clears the top bracket. This bracket is necessarily designed to fit loosely enough so that the ladder can be moved without inclining it so far from the vertical that it becomes unbalanced and hard to handle.



POWER AND LIGHT

Portable Instrument Panel Helps to Fix Relay Settings

GILBERT LINDGREN, *Electrical Foreman Hudson Valley Fuel Corporation Troy, N. Y.*

The illustration shows a portable instrument panel which we have found to be very useful. It is made of wood and carries a graphic voltmeter,

graphic ammeter, and a watthour meter. At the back, space is provided for carrying the necessary current and potential transformers.

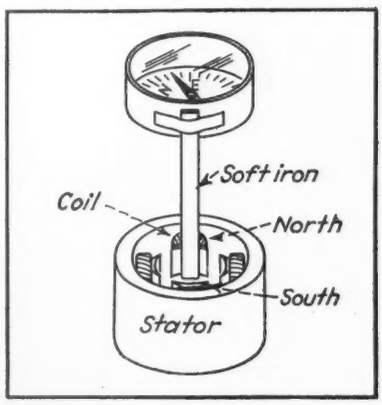
This panel is used to get a graphic picture of the load on the motors driving various kinds of equipment, largely for the purpose of determining the proper setting of the protective relays.

•

How to Test Polarity on Small Motors

ED SWAN, *Kearney, Neb.*

When making compass tests on very small motors it is sometimes impossible to get a compass small enough to go inside of the stator. By taping a soft iron strip to the outside of the compass, and placing the other end of the strip against the pole, the compass will indicate the correct polarity when direct current is sent through the windings.



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Finds Demand Control Worth More Than It Costs

MILTON K. CREWS, *O'Fallon, Ill.*

Holding the electric power demand down in a fully equipped stove factory is a big problem. Some few pieces of equipment can be controlled with automatic devices, but on the whole effective control becomes simply a matter of constant watchfulness.

In tackling this problem we established, first, the theoretical demand for each individual motor, furnace, and string of lights. This information was then charted by departments and an accurate record of operations maintained for an entire month. At the end of this period the chart was compared with the power company's meter chart, to check the theoretical figures. The analysis proved that our estimates were correct; therefore we were ready to proceed with the development of our plans.

The following month a complete

operating schedule was developed in advance, whereby various departmental loads were staggered to dovetail in with those of other departments.

During the recent slack period this plan has proved most satisfactory. High peak loads were reduced considerably, and low valleys were filled in as an offset.

Now we contemplate establishing a central control system, feeling that we can well afford to pay a man to do nothing else but look after this one feature.

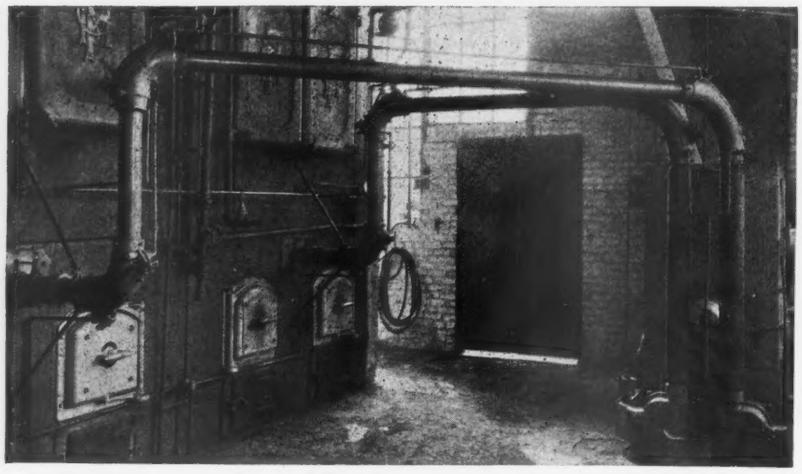
Aluminum coating applied on busbars immediately after installation prevents their oxidizing under adverse atmospheric conditions. It's said to last longer than banana oil or lacquer.

One Stoker Serves Two Boilers

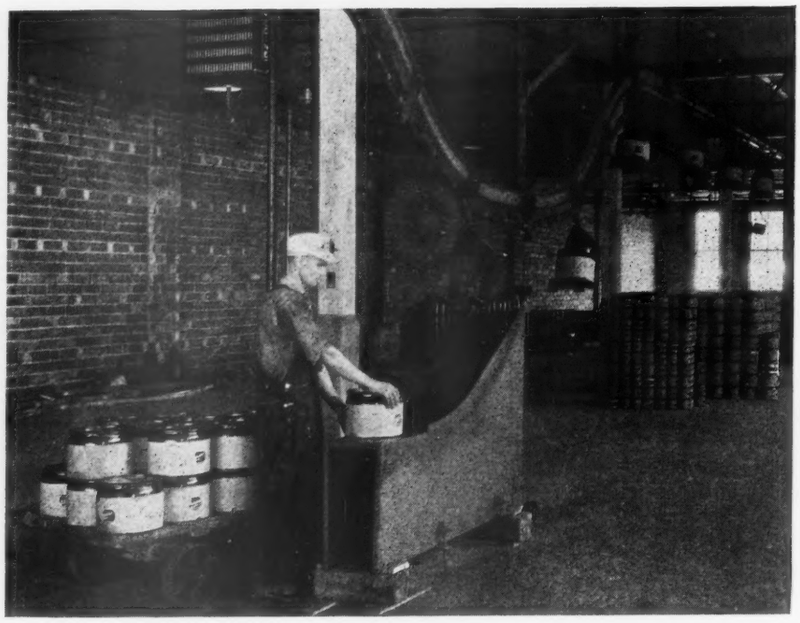
SOURCE
Iron Fireman Manufacturing Company
Portland, Oregon

In the plant of Pressed Metals of America, Inc., Port Huron, Mich., two 125-hp. boilers are served by one stoker.

A stream of high-velocity air conveys the lump coal and made this installation possible. The stoker was fitted with a dual conveying system, by means of which the coal is blown into both boilers simultaneously. The larger pieces of coal burn in a shallow layer on wide grates, while the fines burn in suspension. The stoker's 1200-lb. hopper is filled from a 30-ton bunker by means of a conveyor.



Stoker, at the right, feeds coal to both boilers simultaneously



Buckets slide down into convenient handling position on the unloader

Unloading the Trolley Conveyor

SOURCE
Jeffrey Manufacturing Company
Columbus, Ohio

Trolley conveyors, because of their flexibility of travel in various plants, find wide application in handling jobs. This installation was devised to handle 100-lb. buckets of lead pigment to and from storage, at the rate of 160 buckets per hour. From packing room to storage, it follows various contours over a distance of 880 feet. The unloading station shown consists simply of an inclined plate set at proper height to catch the lip of the tray. This tilts the bucket forward and allows it a quick getaway down the incline before the swinging tray can hit it. The loading device is equally as effective, permitting the operator to push the capped bucket into place without tilting.

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Added Conveyor, Saved Handling and 4,000 Sq. Ft.

J. J. CARTER, *Manager of Manufacturing*
Olds Motor Works, Lansing, Mich.

Automobile wheel design has undergone radical revision in a comparatively short time, necessitating many changes in the methods of painting and baking wheels.

Our old method, now discarded, was to bring the steel wheels from the receiving room into the painting department, and have the spray booth operator take a wheel at a time off the trucks, spray it, and place it on steel compartment trucks. These trucks were then pushed into box ovens for baking. Striping after the painting involved handling these heavy steel trucks once more. This handling was, of course, heavy and laborious, and required large amounts of floor space. Six trucks were required, each 8 feet in length.

Because of the frequent loading and unloading, oven temperatures varied constantly, presenting an additional difficulty.

Instead of the box ovens, two ovens 6 ft. wide and 70 ft. long were

installed. A conveyor carries the wheels from the spray stations. through the ovens, around a cooling loop, and then through another spraying and baking operation.

Striping is done in the same way. Wheels are removed from the conveyor, striped, and hung back on for a round trip through the second oven. After running around the second cooling loop, the wheels are removed and the tire is added.

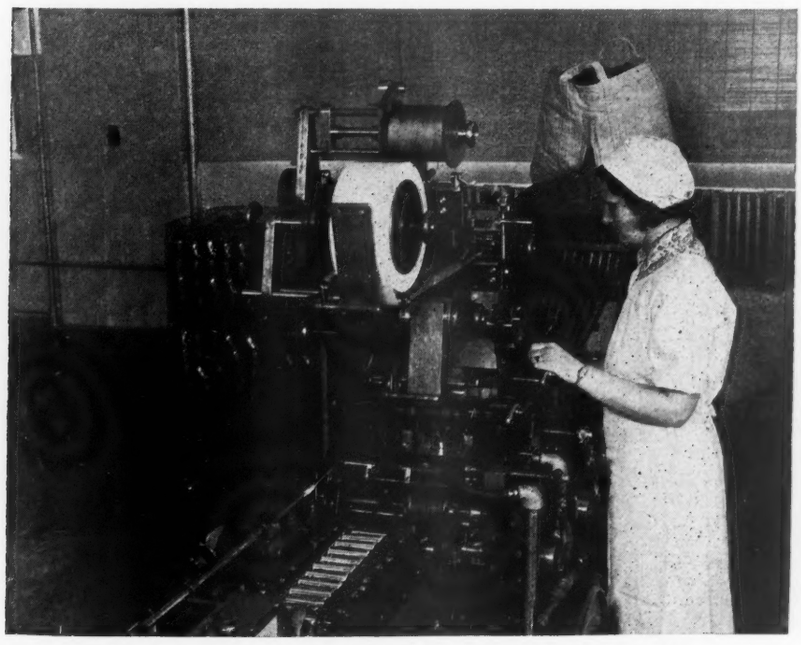
Net result of this change was a saving of some 4,000 sq.ft. of floor space. In addition, work flows more uniformly through the department, and there is less difficulty in getting through enough wheels to meet the production schedule. Because this conveyorized handling method permits a more even baking temperature there are fewer rejections.

Zipper Control

SOURCE
Beech-Nut Packing Company
Canajoharie, N. Y.

Canvas bags with zipper openings are used at this plant to transport lozenges from the machines in which they are made to those in which they are wrapped.

Interesting thing about these bags is that they become hoppers when they reach the wrapping machines. The zipper on the bag makes it possible for the machine operator to control the flow very closely. She merely zips to increase the flow, or cuts down on the opening if the lozenges are coming too fast.



If those lozenges are coming too fast, just zip the bag closed

Gas Torch Makes Easy Work of Removing Coupling Flanges

K. B. HUMPHREY, *Sayreville, N. J.*

Bending of a piece of 4 15/16-in. shaft made it necessary to remove the coupling flanges and fit them on a new piece.

It was thought that use of a hydraulic press would be the best method of getting them off. However, it was found that a pressure of 40 tons, the capacity of the only press available, was not sufficient to move them.

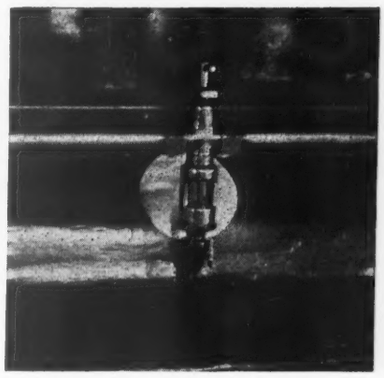
Use of different couplings was not feasible because it would have involved taking off the other half of the couplings from the section of shaft still in place.

As the best way out of the difficulty a 1-in. hole was drilled through the shaft and, with the flanges still in place, a cut was made with an oxy-acetylene torch longitudinally through the shaft at the keyway. This cut spoiled the key but did not injure the flanges. After it had been made the piece of shaft was easily driven out. The flanges were then heated in a forge and shrunk on to the new piece of shaft.

A gas torch comes in very handy in many cases where it is necessary to remove some part that has been put on with a shrink fit. In another instance a pinion on a hoisting engine was removed in this way. The cut was made from the outside of the pinion directly along the key. Of course, the key was ruined, but removal of the pinion was easy.

The new pinion was then shrunk on in the usual way.

Safety bar mounted between the two sides of a belt will catch the belt if it runs off the pulleys, preventing possible damage to materials and injuries to employees.



Made the Sight Feeds Visible

CHARLES C. LYNDE, *Kilgore, Tex.*

One plant, finding that regulation of lubricating oil was apt to be erratic because fogging of the sight feeds made it difficult to check the flow, painted light backgrounds with aluminum paint directly behind the glasses. Seen against the bright spot, the thin column of flowing oil, or even the drip-drip of a more closely regulated feed, is readily seen and any change instantly noted.

The bright reflection spots have also speeded up inspection. Condition of the stream of lubricant is more quickly determined by a glance than formerly was possible with a close inspection against the dark background. The bright background also brings the oil into sharp contrast, and permits visual note of any change in color or composition before the change has progressed far enough to cause damage to the bearings being lubricated.

Records kept in one plant showed a 10 per cent saving in oil used after painting in the bright disks, due to better regulation and elimination of bearing troubles traceable to oil failures.

PRODUCTION PLANNING AND CONTROL

Record Gives Buying Information at a Glance

SOURCE
Remington Rand, Inc., Buffalo

The Manhattan Shirt Company, New York, has combined a loose-leaf color goods record, a gray goods record, and a swatch record into a control plan that follows raw materials straight through to finished shirts. One glance supplies all the buying information needed, gives the details of movements from mill to mill, reveals dates and quantities of receipts from various sources, and discloses invoice data.

•

Two Simple Layout Changes Save Travel

B. MASCOLO, *Production Engineer*
New Jersey Machine Corporation
Hoboken, N. J.

Two simple layout changes have saved us many steps. In no sense undertaking a complete revamping of our plant layout, we moved just two units—a finished parts stockroom and an assembly bench—because they suggested themselves as changes easy to make. So we did.

It's a story best told in pictures. By combining two finished parts stockrooms into one, doing all finishing work at one bench instead of two, and splitting another bench into two units so as to separate assemblies of two different models, we simplified operations. Material moving from the machine shop to finished parts stores, and out through assembly operations to shipping, travels a considerably shorter distance than it used to.

•

Cupboard for Blueprints Saves Time and Mistakes

WILLIAM A. FULLER, *Charles City, Ia.*

Some time ago a workman in our department put one tooth too many in about 50 gears which he was roughing on a gear shaper, because he "remembered" the number of teeth, and did not bother to get a blueprint. It was not the first time that a mistake of this kind had been made; therefore ways of preventing a repetition were sought.

At that time all blueprints were kept in the tool crib and whenever a workman changed jobs it was necessary to go there, turn in the print for the preceding job, and check one out for the job he was going to do. This procedure took a pieceworker's time and gave him an incentive to rely on his memory.

Eventually one of the men suggested that a cupboard be made up for each of the seven departments in the building. This cupboard is intended to hold all the prints used in the department. It is the responsibility of the department foreman and the inspector to see that these cupboards are maintained in order, and that the necessary prints are kept on the jobs.

Adoption of this arrangement has not only practically eliminated scrap caused by failure to remember some dimension or detail, but has actually resulted in a saving of time for the workmen, who no longer have to make the trip to the tool crib.

PUBLIC AND EMPLOYEE RELATIONS

Lunch with Music

SOURCE
RCA Manufacturing Company
Camden, N. J.

They say that the shoemaker's child never has a pair of shoes to wear. Contrary to this aphorism, RCA Victor, makers of sound systems among other things, has installed an elaborate sound amplification system in its immense lunchroom and cafeteria.

The new system consists of five "high fidelity" sound reproducers of the type used by most broadcasting stations to monitor their sound output. These reproducers have been placed to distribute the sound with uniform volume and quality throughout the building. Popular and classical recordings are played, and a velocity microphone has been provided for speeches and announcements.

Also, a microphone can be set up outside the building to pick up the music of the RCA Victor Athletic Association Band which gives daily concerts in Johnson Park during lunch hour, weather permitting.

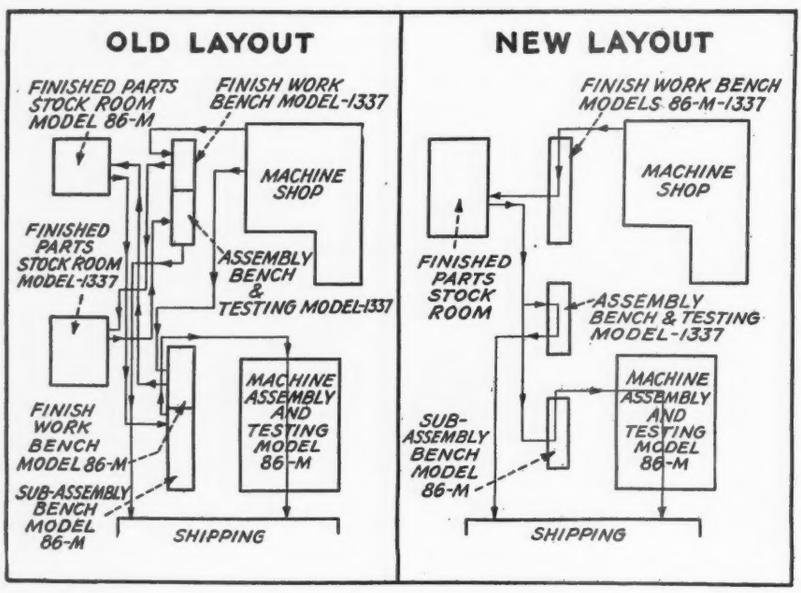
•

Smoking Permitted —in Safe Places

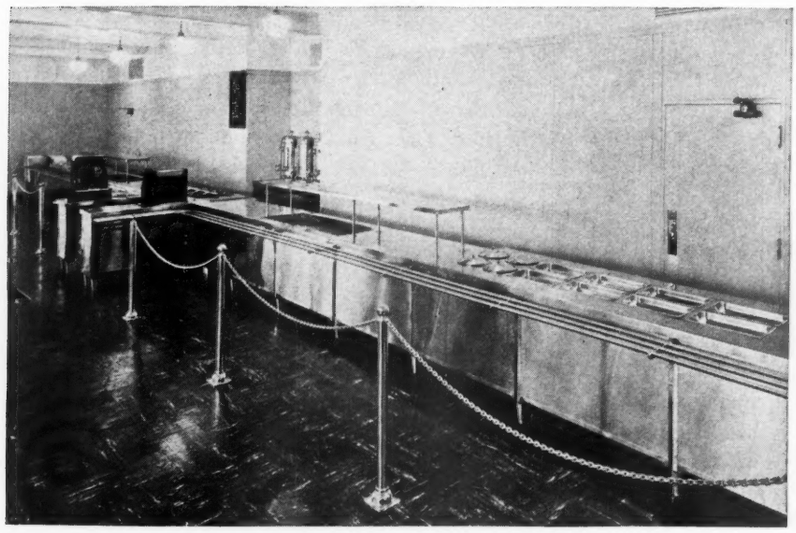
S. H. COLEMAN, *Roanoke, Va.*

Realization that no-smoking rules were frequently broken, in the face of drastic penalties imposed where violations were detected, has forced the management of a large organization having many fire and explosion hazards in its plants, to substitute a system of common-sense smoking regulations for absolute prohibition. Under the old system, a man desiring a smoke invariably picked out a place where he was reasonably sure of not being apprehended, and unfortunately these usually were the places where the most hazardous conditions existed. The new system designates certain areas where smoking is allowed, providing of course that it is done at convenient times and intervals.

Smoking is permitted in the plant cafeteria, offices, and toilets in non-hazardous sections, and in the various maintenance shops where there is no danger of product spoilage or of fire. Where smoking is dangerous, em-



ployees are given rest periods in the morning and afternoon during which they are privileged to go to the plant cafeteria. This method of control, in addition to eliminating surreptitious smoking, has been an important contributing factor toward an unusually high morale in the company's plants.



Way to employees' hearts may be through the stomach. The Hoover Company, North Canton, Ohio, surmises that this may be true, has dressed up its company cafeteria dining room and kitchen with stainless steel equipment, in order that employees may eat their lunches in pleasing surroundings

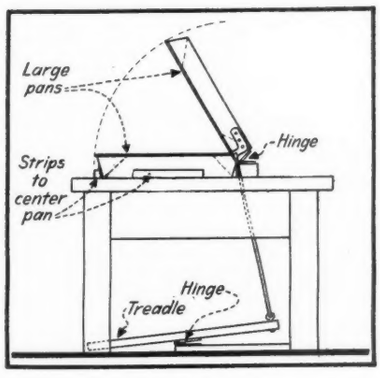
PRODUCTION METHODS AND MATERIALS

Waste of Gasoline Reduced by Self-Closing Cover on Pan

JACK BEATER, *Shop Manager*
Harley Electric Service Company
Fort Myers, Fla.

Workmen in our motor rebuilding shop were using from 2 to 3 gal. of white gasoline a day for washing small parts. Taking the idea from certain other self-closing containers, we made a new wash pan with a lid that closes automatically. Since this new pan has been in use it has cut down considerably the consumption of gasoline for washing purposes, by reducing evaporation. The same amount of cleaning as formerly is now done with 2 gal. of gasoline a week.

As shown in the drawing, the washing pan and lid were made from two large, square baking pans. The lower pan is held in place by strips nailed to the bench. The upper pan is hinged on a block of wood. A rod attached to the upper pan connects to a treadle hinged close to the foot. While washing parts the workman must keep his foot on the treadle, to hold the lid up. When he moves away the lid falls, reducing evaporation and danger of fire.



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Magnetize Steering Knuckles to Find Flaws

SOURCE
Pontiac Motor Division, General Motors Corporation, Detroit

Special testing equipment whose operation is based on the simple principle of magnetization is being used to detect flaws in steering knuckles. The inspector places each part in a fixture for an instant, where a high flow of current completely magnetizes the knuckle. Then he places the part in a dip tank filled with a liquid such as kerosene or thin oil, into which iron oxide powder has been mixed.

If the slightest flaw exists in the part, the magnetization makes a horseshoe magnet of the fracture or crevice. One edge of the crack is the north or positive pole while the other edge becomes the south or negative pole. In its magnetized condition this fracture-horseshoe instantly attracts a quantity of iron oxide from the solution, and the particles take their places along the full length of the flaw. When the part is taken from the dip tank there is a deposit of powder wherever there is an imperfection. Whenever that occurs the part is thrown out.

Parts that are O.K. and show no forging cracks are quickly demagnetized in a special fixture.

•

Rubber Cup for Litharge Paste

J. D. CARUSO, *Time Study Engineer*
The Bastian-Blessing Company, Chicago

A thick-walled rubber ball, such as a tennis ball, cut in half, makes an ideal container for mixing and holding litharge-glycerine paste. Any dry residue adhering to the rubber can easily be flaked off by squeezing the sides, or turning the cup inside out.

It will be found that a rubber cup such as described is much superior to the usual metal dish, which must be struck sharp blows to loosen any hard residue, with the result that the material is scattered around, and the dish soon becomes all battered up.

•

Metal Bushings Increase Life of Wood Templets

FRANK J. BRABENEC
Automatic Electric Company, Chicago

Many wood parts used in telephone equipment require the drilling of a considerable number of holes. Frequently, however, there is not a sufficient number of these parts to warrant tooling up with steel drill jigs. Formerly wood templets were used, but they did not stand up well because the holes soon became oversized.

To overcome this difficulty it was decided to protect the holes in the templets with metal bushings. It was found that drill sizes Nos. 2, 22, and 34, were most frequently used.

This expedient resulted in a substantial annual saving because wood templets protected in this way last many times longer than those without bushings.

EDITORIALS

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Maintenance Needs Management's Tools

PROGRESS in applying the principles of good management to the maintenance department has been rapid during the past few years. One doesn't have to go back so many years to reach the day when the maintenance department, by whatever name it was called, was in the average plant merely a loosely knit organization composed of members of several trades.

Admittedly maintenance work does not readily lend itself to the rigid analysis and control that can be applied to production operations. Nevertheless, in hosts of well-managed plants the picture is much different today. Accurate records of maintenance activities and costs over a considerable period give a sound basis for planning and cost control. If definite budgets are not altogether the rule, they are by no means the exception. And, year by year, more plants are adopting them.

Careful planning and scheduling of the work are doing much to smooth out peaks and valleys, with the general result that jobs are started and completed according to a definite plan, and overtime work is less frequent.

Application of time and motion study, with incentive payments, to maintenance work presents obvious difficulties, but they are not all insuperable. In a few plants at least a considerable degree of success has been attained in putting certain kinds of work on an incentive basis, to the advantage and profit of both the men and the company.

Where Plant Fires Start

RESULTS of a study by the Associated Factory Mutual Fire Insurance Companies on the frequency and causes of fires in industrial plants will give operating executives some valuable suggestions regarding the places and conditions that need the closest watching.

Probably no one will be surprised to learn that the number of fires and explosions follows closely changes in the rate of production. Most fires involve some process or the equipment used in conducting it and, therefore, occur only when the plant is in operation.

Over a recent five-year period, 18 per cent of the fires were of electrical origin; 12 per cent were caused by foreign material which was mixed with stock being processed and produced sparks when passing through machines; 10 per cent were caused by sparks arising from friction or other mechanical sources; 9 per cent arose from spontaneous combustion; 8 per cent from hot surfaces; and 7 per cent from smoking. Other causes of fire included friction, open flames, sparks from cutting and welding torches, process overheating, hot bearings, lightning, and chemical action.

Fires or explosions which cause interruptions to production are particularly troublesome and costly to manufacturers. During the five-year period mentioned previously, 33 per cent of the amount paid under use and occupancy insurance involved electrical power apparatus; 10 per cent was due to poor maintenance of machinery; 8 per cent to poor housekeeping; 7 per cent involved opener-picker processes in cotton mills; and 6 per cent involved dryers and ovens.

The remaining losses resulted from firebox explosions in boilers using gas or pulverized fuel; flash fires in flammable liquid processes; lack of complete floor cutoffs; incomplete or defective sprinkler protection; and other miscellaneous factors.

These studies covered a large and representative group of the leading industrial plants and other large properties in the United States and Canada. Average fire insurance on individual properties in this group is more than $1,000,000, with the total well over $9,000,000,000. The plants are all of superior construction and have adequate private fire protection systems. Special hazards are properly safeguarded. Managements are of high character, and the so-called "moral hazard" is practically absent.

Beware of Low Voltage, Too

BETTER BUSINESS automatically clears up a good many problems, but there is one troublesome condition which becomes worse, rather than better, as more orders flow in. That condition is low voltage. It is the unsuspected cause of about as many kinds of trouble as anything we can think of at the moment.

Overloaded or inadequate wiring probably is most often at the bottom of the trouble. Regardless of the exact cause, low voltage is often the reason why motors overheat or stall on loads which they should be able to carry. That is because the torque of an induction motor varies as the square of the voltage. Therefore, when the applied voltage drops 10 per cent, say, the torque is reduced to about 81 per cent of normal.

Light output of incandescent lamps, too, falls off rapidly as the voltage drops below normal rating. For example, a 5 per cent drop in voltage will decrease light output about 15 per cent.

A voltage survey can easily be made, when there is any doubt about conditions, at a cost that is trifling when compared to the value of the results. It may reveal profit-destroying situations that have not been suspected. In any event, it will do one very important thing—show whether the electrical equipment is being properly supplied by the distribution system.

THE ABC's OF PERSONNEL

Through the personnel alphabet with a plant manager who came up from the ranks and therefore knows pretty much what's on employees' minds. Next month, some E's and F's

CHARLES S. STEVENSON

General Manager, Hall Brothers, Inc., Kansas City, Mo.

SKETCHES BY ORIN W. LOO

Chivalry

A new employee reports to her mother: "I never really realized before what a difference little acts of courtesy can make. The one thing that impresses me most at the plant is that when the girls get on the elevator all the men take off their hats. Lots different from Taylor's." While opportunities for chivalry present themselves most frequently in contacts with women, there are many courteous considerations for men that can react favorably. Allowing precedence at a drinking fountain . . . stepping aside to allow others to pass through a door . . . the quick offer of a match . . . the choice of location of seats at meetings, and similar small amenities can establish you as a person of courtesy and regard. As for girls and women—arising, if seated, upon their approach . . . the carrying of packages or papers when thrown together casually . . . the immediate offer of your chair, and the like, can easily make many admirers. Most folks may not *demand* courtesies, but they notice who *does* and who *does not* observe them. Graciousness and courtesy are free . . . but they pay big dividends!

Cliques

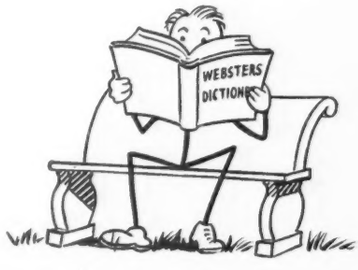
Whether workman or supervisor—*never* get mixed up in any cliques. Take a position, by all means, on issues or problems that arise, but base it on reasoning and *never* on personalities. A conversation: "Stanford didn't even consider MacDaniel for the new job because Mac belongs to that stuck-up scheduling bunch and thinks anybody from the plant is an outcast. The old man said it was too ticklish a job to hand to anybody with that kind of ideas. I just heard that Joe Masefield, factory superintendent, gets the new place . . . Mac will never be able to figure that out!" . . . many men and women are in the same fix, but they can't figure it out, either. What side are you on—*or have you figured it out?*"

Criticism

Don't make criticisms, make *suggestions!* One rule in making criticisms (suggestions) which, if followed, will never get you into trouble: *Talk to the other fellow as you would like to be talked to yourself.* Successful handling of personnel is based on successful handling of criticism (suggestions). In executives and leaders the art of criticism (suggestions) is one that bears constant study.

Diction

"I can't figger out why I didn't get one of them two sales jobs," said young Banks to one of his girl friends. "Jim's the sales manager and him and I graduated together." "Did you write for the job or ask for it?" she queried. "Aw, I just sez to Jim, 'I ain't doin' so well, Jim. How's about a sales job?'" "Well, you have just said about thirty-six words to me . . . but you have made three grammatical errors and used some very sloppy English. By the way, tomorrow night's date is off—I'm busy." An inoffensive way of developing and holding your dignity is by care in the use, choice, and arrangement of words and expressions . . . and the higher you go, the more important this is.



Discharges

After a person is discharged, don't think he never sees any of his associates any more. He does . . . and goes over all the details of his release with any who will listen. Unless you have used all the diplomacy and tact you possess, you will find the word passed along the line that you are a tough hombre and a hard egg . . . and your road will get just a little rougher. Handling a release properly demands a high degree of personnel finesse . . . an effort to keep the good will and friendship of the person you are discharging should be the guide to your approach and the basis for any discussion. "The people I fire worry me more than the ones I keep," said Superintendent Crawford. That one remark stamped him as a real person—human, sincere, sympathetic—necessary attributes in leaders.

No more passing the buck. This company only recently overhauled all its equipment, is determined to keep it in good shape. So all maintenance is centered in the master mechanic, who also is in charge of layout and routing. The result is a better job of maintenance at a lower cost than ever before

No-Alibi Maintenance

J. W. BRUSSEL
Works Manager
Federal-Mogul Corporation
Detroit

When John William Brussel tackles a problem, he is apt to peel off his coat, and sure enough that is how the candid camera caught him for FACTORY. *He says his parents intended him to be a schoolteacher, but he liked machinery better. So he worked in a number of machine shops in his home town of Muskegon, Mich. His first important job was as general foreman with Garford Motor Company, Elyria, Ohio. He went to Dyneto Corporation, Syracuse, in 1919 as factory manager; to the Chrysler plant in Elizabeth, N. J. in 1920 as superintendent. From 1922 to 1935 he was general manufacturing manager of Timken-Detroit Axle Company. His first contribution to* FACTORY, *on the control of indirect costs, was published in September, 1937.*

ALL TOO FREQUENTLY does the opportunity exist for disagreements between the maintenance department and production supervisors as to the responsibility for maintenance work. This may, and frequently does, extend to the cost of repairs made necessary by neglect of equipment.

After a period of below-normal maintenance, we have about concluded a program of general overhauling of all equipment. Machine bearings have been replaced, and bed plates scraped, to secure requisite accuracy. All shafting has been equiped with roller bearings.

A new floor and roof repairs were included in this general program. Also, the load on all motors used in the plant was tested against the rated horsepower. This check resulted in a reduction of 150 motor horsepower, which effected a material saving in power charges.

With the building, productive machinery, and general factory equipment, such as shafting, motors, and conveyors, in good condition, the next move was to insure that proper maintenance would keep everything in good condition.

To avoid disagreements between productive supervisors and the superintendent of maintenance, we decided to include all maintenance under the master mechanic and require, furthermore, that oiling of productive equipment be a part of his responsibility.

The master mechanic's duties now include:

1. Factory layout.
2. Routing.
3. Tool design.
4. Maintenance of all general factory equipment, including the power plant.
5. Supervision of millwrights.

Not only must he decide how a thing is to be done, and on what machines it should be run, but he must also see that the equipment is in proper condition for producing the parts efficiently and of the required quality.

To avoid disagreements and to centralize responsibility, expense involved in maintaining and repairing all *general* factory equipment is charged against the master mechanic's division irrespective of the location of this equipment. This includes overhead conveyors, cranes, motors, controls, and shafting.

Maintenance of production machinery is charged to the departmental supervisor, but even here the master mechanic has an important responsibility. He must see that the machines are properly oiled, and must decide when a machine needs overhauling.

Oiling is functionalized under the master mechanic. We have an oiler in the foundry, one for each shift in the machine shop, and an oiler for all overhead equipment. These men are millwrights with sufficient experience to know when a piece of equipment is functioning properly.

Visible oil cups have been installed on all equipment, and it is the job of these men to see that oil feeds properly to moving parts. Moreover, this oiling is done on a regular schedule; every piece of running equipment must be oiled every day.

Thus the maintenance organization not only looks after general factory equipment, but also covers production machinery. It is our experience that productive workers will not oil their machines. If on incentive, they will not take the time to do it; if on day rate, they will take too long, or, through lack of knowledge, do a poor job of it.

To be sure, the foreman is not relieved of complete responsibility. The

maintenance expense of his equipment is a part of his budget, which means that, if an oiler seems to be neglecting his job, he will be called to task by the foreman.

As a part of the master mechanic's responsibility, all chips are removed from productive machinery, since this affects the functioning of the machine and influences its maintenance cost.

For a normal force of 900, the duties just described require 35 men. These include millwrights, janitors, chip men, machine repair men, an electrician, oilers, and crib men.

Some question may be raised as regards this grouping under the master mechanic. Certainly it expands the duties normally considered a part of his responsibilities. But there is no question that our maintenance is better done and at a lower cost than before this set-up was inaugurated. The same argument holds for using as oilers men who have machine experience, and consequently are able to judge when machinery is running properly.

Looking down the cadmium-silver machining department where, as in all other departments at Federal-Mogul Corporation, the master mechanic is directly responsible for lubricating all production machinery. He has three oilers on his staff. All three are millwrights with enough experience to know when a machine is functioning properly and when it isn't

The Wage–Hour Law and Wage Differentials

MORTIMER FISHEL

General Counsel, National Work Shirt Manufacturers Association, New York

SINCE ENACTMENT of the Wage-Hour Law everybody from the Administrator down to the election campaigner has been trying to estimate the number of workers affected by the law. All estimates have one thing in common; they are based on the number of workers receiving subminimal pay, that is less than 25 cents an hour, prior to October 24, 1938, the date the law went into effect.

But all persons moved to guess at the figure presumably ignore one of the most elementary and fundamental principles of factory management, the principle of the wage differential. In this they follow in the footsteps of nearly all writers on wages and labor relations.

And, indeed, it should cause no surprise that the principle of the wage differential should be unknown to persons at a distance from actual factory operation, when manufacturers, who must face problems of wage structures and wage relationships at first hand, signally fail to appreciate its importance or perceive its implications. In none of the discussions of the Wage-Hour Law that both preceded and followed its enactment, is there to be found any greater insight into the operation of the principle, or, in fact, any knowledge of its existence on the part of manufacturers and employers, than there is in the statements of government officials and writers.

The principle may be stated as follows: *Where there are differences in the earnings of groups of employees in a plant, efficient shop management dictates that such differences must be preserved in the event of changes in any part of the wage structure.* It is immaterial to what the differences in earnings are due, whether to length of service or to the character of the work performed. A change in the pay of one group necessitates a corresponding change in that of the others. Failure to observe this leads to discord between management and employees.

Modifications of the wage structure must be made with an eye to the preservation of existing earnings relationships. This is, of course, on the assumption that the relationships have prevailed long enough to have become accepted by the employees as equitable. Wage rates in a factory, like the organs of the body, are interrelated and interdependent. Furthermore, the wage rates of different groups of the working force are related not only to one another but also to the salaries of the supervisory staff, though here the responsiveness to changes need not, as a rule, be as close as in the case of rate changes among the different wage groups. A foreman getting $40 a week, where the employees under his charge are getting $25 a week, will not be content to continue at the same salary when his employees' wage is raised to $30.

The number affected by the Wage-Hour Act is therefore much larger than even the highest figures yet published. These estimates all err because they fail to take into account the wage-differential principle.

It is to be noted that the above has reference to wage rates *within* an establishment. It does not touch on the interrelations of the wage structures of different plants in the same industry nor, what is far more important, the interaction of wage structures of different industries.

Always 70° in This Machine Room

The plant that air-conditions machining operations still makes the headlines. Hence this description of the constant-temperature room where Plymouth finishes pistons and connecting rods to closer-than-ordinary tolerances

CHARLES C. WILLIAMS, *Plant Engineer*
Plymouth Motor Corporation, Detroit

The author: Born on the Ohio farm his grandfather cleared in 1834. Present connection dates back to the day Chrysler took over Chalmers. Set up present Plymouth plant, built the Los Angeles factory, reconditioned the one in Evansville.

WHEN we decided to do finishing operations on pistons and connecting rods in a room where constant temperature could be maintained, and apart from general machining work, these operations were moved into a room whose walls and ceilings were insulated from outside temperature changes.

This room, 63x200 feet with a 16-ft. ceiling, is inclosed on all sides with walls of glass block. The ceiling is a double thickness of wallboard, with an air space between the layers. Above it is the roof.

One wall separates the room from an inside loading dock; the other three sides are outside walls. The glass block, we find, transmits 75 per cent less heat than ordinary steel windows; with heat losses reduced by this insulation, it is not difficult to maintain a constant temperature of 70 to 72 degrees.

At present, air is drawn from the outside, passed through unit heaters above the ceiling and introduced through vents. The volume of air, and its temperature, are both strictly regulated for our exact requirements. Volume is adjusted, of course, to compensate for losses through conveyor openings or doorways.

View down Plymouth's temperature-controlled room shows final machining on connecting rods at the right, on pistons at the left. Note air ducts along the ceiling. The floor is pitched 3 inches lower at the center, and the steel floor grating covers a sump into which waste oil and cutting fluid from the machines can be flushed

If the big hot-water tanks used for washing and plating had been kept inside the room, they would have seriously complicated the problem of temperature control. We avoided this by placing them just outside the room, with conveyors linking them with the other operations.

Between final machining and burring operations, and the diamond-bore of the wristpin hole, a plating operation is required. If the large tank used for this operation were placed in the natural sequence of flow, it would be adjacent to the bench where the pistons are weighed and inspected for size.

At this point in the process, however, the pistons are hung on an overhead chain conveyor and taken to the plating tank outside one end of the room. After plating, they are run through a temperature-control tank to bring their temperature down to 70 degrees; then they are taken back into the room.

One exception to the segregation of "hot jobs" is a small wash tank following the diamond-bore operation. But this is small, and an additional temperature control is provided before the pistons move to the electric gages for final check on diameter.

Cooling Tunnel

From the wash tank the pistons move by chain conveyor through a 6-ft. cooling tunnel. This consists of a tube surrounded by cooling coils. The 4-min. trip through this apparatus reduces the piston temperature to 70 degrees. Result is that the gaging is always done at this temperature, and any variation from standards is due to process faults, and not to vagaries of the weather.

Following this final gaging, pistons are stored according to outside diameters. The bins are open at both sides, the assembly bench being on the side opposite the piston-marking and bin-loading point.

At one end of this assembly bench is a Telautograph which tells the assemblers the exact cylinder-bore size of the motors starting down the engine line. They then take from the shelves the proper pistons of corresponding size. Rings, wristpins, and connecting rods are added, and matched according to weight. The sets are placed in trays suspended from an overhead chain, and taken out of the insulated room to the motor assembly. This is done 45 minutes before the engine reaches the assembly station on the motor line where the piston assembly is to be inserted.

Piston production has been stressed up to this point, but the same process is followed for connecting rods. Lapping the crank hole, reaming the pin hole, diamond-boring, burnishing the pin bushing—all are done in this room. Following the diamond-boring operation, rods are taken out by chain conveyor to a large alkali wash tank. After the wash, they are cooled down to 70 degrees and returned to the weighing bench, where they are divided into weight classes and stored ahead of the assembly bench.

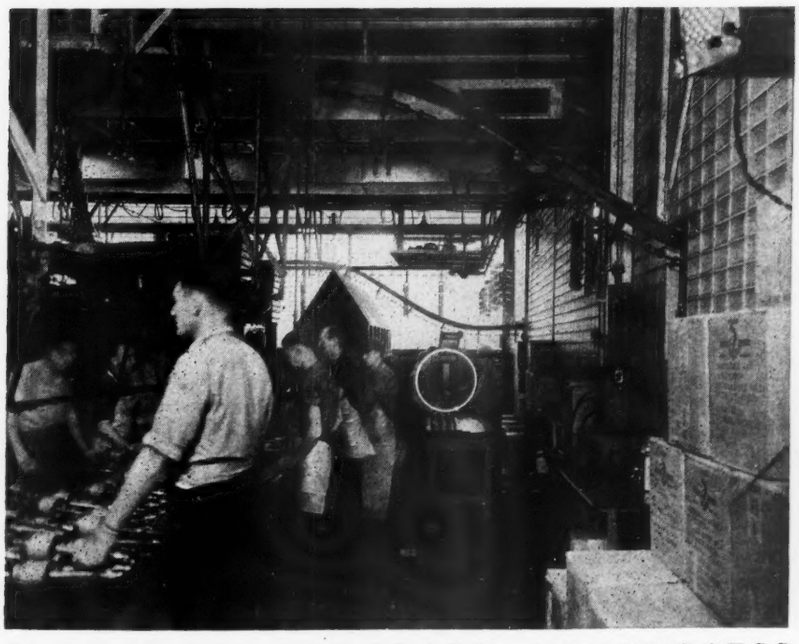
The layout of operations, both for pistons and rods, follows the sequential pattern to be observed throughout the plant. All machines are motor driven. There is no lifting; conveyors bring parts to the employee and take them away. Machines are placed close to conveyors, and where tote boxes are provided, the employee has only to pull the box to his table, which is the same height as the conveyor and bedplate of his machine.

Pistons are machined on one side of this insulated room and connecting rods on the other, both winding up at the temporary storage point adjacent to the Telautograph.

When this room was built, the floor was given a pitch of 3 inches to the center. Down the center aisle runs a trench, covered with an iron grating whose surface is even with the floor level. Several times each week the entire floor, including the space around the machines, is flushed. Cutting compound thrown out from the machines, or spilled from the parts in handling, drains down into the trench and is carried off through the sewer.

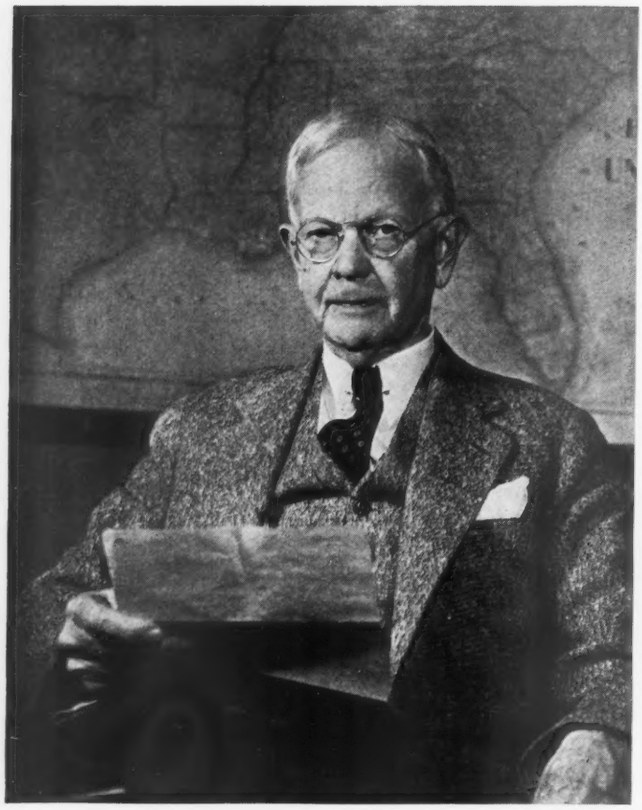
Pistons and connecting rods are assembled at the bench in the foreground, are carried to motor assembly by the conveyor paralleling the bench. The circle marks the Telautograph which tells the men what piston sizes are needed on the motor line. The conveyor that disappears through the hole in the glass block wall is delivering rods to the washer

PROOF AGAIN THAT AIR CONDITIONING



IS GOOD FOR ANY PLANT, ANY PROCESS

Keep Leather Belts Healthy



J. A. WEBB
President
J. A. Webb Belting Company
Buffalo

Attendance at the Philadelphia Dental College, the Medico Chirurgical College of Philadelphia, and a couple of universities gave the author the degree of Doctor and fitted him for professional work, which he followed for some years. More than 30 years ago he dropped the Dr. and in partnership with an older brother started to make leather belting, in Kansas City, Mo. About the time the boys began coming back from "over there," he moved to Buffalo and founded the company of which he is now president. Fifteen years ago he began experimenting with belt dressings, for the purpose of developing one that would give maximum pulling power without harming the belt. This work led to a long and thorough study of the many factors that influence the life of leather belting. Results of this work are summarized here.

Most oak-tanned belts don't wear out; they are destroyed by certain "diseases" or abuse, before they reach old age. That means unnecessarily high cost of power transmission

THROUGH THE YEARS leather belting manufacturers have been alert in improving the quality of their product and the service it gives. Belts now operate without ply or lap separation at much higher speeds than were formerly possible. Pulling power has been increased to belting's maximum degree of elasticity, without the use of foreign materials of a sticky nature. Improvements in manufacture have greatly lowered the cost of cementing waterproof belts.

It is safe to say that progress in belt making has kept pace with the advances in other industries. One phase of the subject, however, has been grossly neglected—causes of the deterioration of leather belting and possible methods of prolonging its life. There is little significance in how well a belt is made if, in the end, it is subjected to abuses and mistreatment which greatly shorten its period of usefulness. When the statement is made that all oak-tanned leather belts destroyed annually fail as the result of some form of abuse, the causes of, and possible remedies for, this condition obviously become an important matter.

Before discussing this subject I wish to acknowledge the valuable assistance of A. W. Hoppenstedt of the A. W. Hoppenstedt Laboratory, Inc. His work, together with my experience in handling many tons of used leather belting from every industry, has made possible an intensive study of the elements or forces that tend to destroy leather belting.

It was found that they all fall within one of two general classifications: (1) mechanical force; (2) chemical forces.

Under class 1, 7 per cent of all oak-tanned leather belting destroyed annually fails as the result of some abnormal mechanical force applied to some external part of the belt.

It can be said for class 2 that 93 per cent of all oak-tanned leather belting destroyed annually fails as the result of some abnormal chemical change in its composition. Under class 2 there are four divisions: (1) air rot; (2) metal or alkali rot; (3) oil rot, and (4) dry rot.

Before considering these four divisions individually, it may be said that all grades of oak-tanned leather must have a certain degree of acidity. This acidity is measured with what is known as a pH meter and should never be less than pH 3. An increase in acidity of a small fraction of 1 per cent will cause disintegration to start. A decrease of one or even two points will affect the wearing qualities only slightly but in all instances where oak-tanned leather has suffered a greater loss, destruction has followed.

Bearing that fact in mind, let us now look at the four divisions of the chemical forces which constantly threaten the life of leather belting.

1. Air rot is brought on by an increase in the acidity of leather as indicated by a drop in pH value below the normal pH 3. This increase is caused by certain factors which are always present in the air. Air rot is sometimes called red rot or acid rot, but since the source from which leather picks up its increased acidity is now known to be the air it will be referred to hereafter only as air rot.

2. Metal rot is caused by small particles of the base metals working into the fibers of the leather, followed by a decrease in acidity. Alkaline fumes also decrease leather's acid content and are, therefore, placed in this division.

3. Oil rot, as the name implies, is the deterioration of leather caused by unsaponifiable matter; that is, by mineral oil or any of its byproducts.

4. Dry rot is caused by depriving leather of its vital animal fat content. It is, in a sense, starvation of leather.

As might be suspected more than one of these four divisions of chemical changes are frequently, if not always, found in any given piece of discarded belting. For example, chemical analysis has shown that no oak-tanned leather belt remains in service long enough to develop oil rot, dry rot, or both without air rot also contributing to its destruction.

In considering what can be done to counteract the agents which destroy leather belting, those embraced in class 1, Mechanical Force, need be dwelt on only long enough to state that there is no remedy unless the abnormal mechanical force can be eliminated. It is sometimes more economical to replace a belt at intervals than to remove the cause of its destruction. Fortunately, however, the number of belts destroyed by mechanical force is comparatively inconsequential.

Equally fortunate is the fact that with present-day knowledge there are remedies for most of the much more consequential chemical forces, and users who understand their causes and remedies can greatly prolong the life of leather belting with a resulting substantial reduction in power transmission costs.

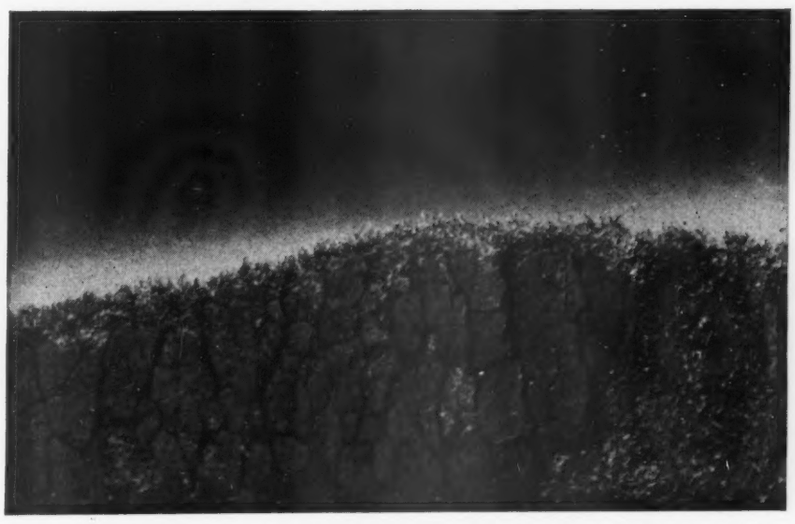
Air rot, as said before, is caused by an increase in the acidity of leather. There are constantly present in the air two impurities which are harmful to leather: sulphur dioxide and sulphur trioxide. All leather is adversely affected to a greater or less degree by these two compounds but under certain conditions the harmful effects are greatly increased. For example, they are formed when coal or gas is burned, and both rapidly unite with the moisture in the air or the natural moisture content of leather to form either sulphurous acid or sulphuric acid.

In some industrial plants where coal, gas, or acid fumes are present in excessive amounts, leather belting will rot so badly in from one to three years that it can be torn into strips with the fingers. In plants where conditions are not quite so bad, four to six years seems to be the average life. Where there are no chemical fumes and coal or gas is not burned in close proximity it, the life of leather belting is greatly prolonged. Nevertheless, under the most favorable conditions, there is no escaping the fact that all forms of oak-tanned leather are subject to the ravages of air rot.

If leather could escape all other unfavorable factors, air rot would still destroy it in the end, unless some counteracting agent were used. This one agent is the direct cause of the destruction of more leather belting than all other agents, both mechanical and chemical, combined. All rotted belts are easily detected, since their natural color usually turns to some shade of red, which denotes acidity.

Study of the causes and nature of air rot led to the development of a preservative solution which can now be had from most leather manufac-

The fibrous structure of new leather can clearly be seen when a piece is pulled in two. After attack by various types of rot, these fibers break down, reducing the tensile strength to a fraction of its normal value



This piece of belting was destroyed by the combined action of air rot and dry rot. Note the shortness of the fibers and the cracked surface

turers. This solution will maintain the correct pH or acid value of leather, thus preventing air rot; or where disintegration has already started, it will restore the correct value.

Metal rot is the only one of the four divisions of chemical forces destructive to leather for which no remedy is known but, fortunately, the amount of leather lost from this cause is negligible. It is brought about chiefly by iron dust or iron rust gradually working into the fibers and reducing the acid content. The leather turns very dark, almost jet black, and becomes hard and stiff. Usually, oil rot or dry rot or both, also set in.

Brass and copper destroy leather in much the same manner as does iron.

Alkaline fumes also destroy leather rapidly by decreasing its acidity. For this reason, alkaline rot is placed in this division.

Oil rot, according to previous definition, is caused by the action of unsaponifiable matter—mineral oil or a byproduct—on leather. The oil may drip on the belt accidentally or be unknowingly applied as one of the ingredients of a belt dressing.

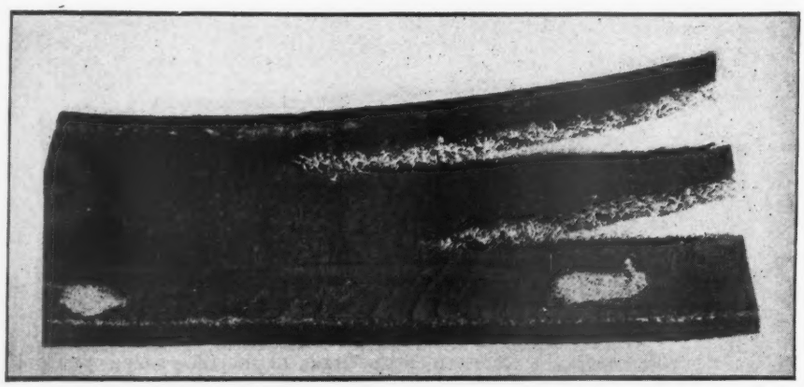
Mineral oil is destructive to leather in many ways. It is readily absorbed and tends immediately to soften and dissolve the belt's vital animal fats, which are then thrown off a little at a time by centrifugal force. Because of the penetrating quality of mineral oil it soon fills all of the air spaces needed to let the belt "breathe" and thus prevent it from heating and burning. Continual application of mineral oil will also deprive leather of the nourishment essential to its life. Thus, it is also one of the serious contributing causes of dry rot, as will be seen.

Elimination of all cases of oil rot is obviously impossible, but in most instances it is merely a question of keeping lubricating oils and greases from spattering or dripping on belting, and of making sure that suitable belt dressings are used.

As a final remedy for oil rot, it is best to return an oil-impregnated belt to the belt maker for treatment.

Dry rot, as previously pointed out, sets in when leather belting is deprived of its normal animal fat content. As with air rot, in extreme cases the tensile strength of double-ply belts may be reduced so much that they can be torn into strips with the fingers.

Consider for a moment why belt makers demand such extreme care in currying a rough belting butt. It is simply because an oversupply of tallow or other animal fats will cause the leather to stretch unnecessarily, prevent it from absorbing a normal amount of moisture from the air, and fill all air spaces, thus causing the belt to heat while transmitting power.



After a combination of oil rot, dry rot, and air rot had done its work, this piece of belting could easily be torn with the fingers. Tests showed that the acid value was higher than normal, and the belt contained 16 per cent by weight of oil and grease, of which 11 per cent was mineral oil and 5 per cent animal fats. The grease content should properly be about 11 per cent

A small variation is permissible, but the amount of tallow and other animal fats used in currying belt leather should average about 11 per cent by weight. This amount will lubricate properly both the long and the short fibers. At the same time it will permit the leather to absorb the 5 to 10 per cent moisture content needed to aid the tallow in properly lubricating the fibers. It also leaves unfilled the large number of small air spaces—about 35 per cent by volume—necessary to keep the belt cool.

It is only natural to assume that if such an exact balance between animal fats, moisture content, and air spaces is necessary or desirable in manufacturing a new belt, it is equally necessary or desirable to maintain that balance throughout the life of the belt. Tests have shown that assumption to be true and demonstrated that leather belting deprived of its normal animal fat content will soon develop some of the various stages of dry rot.

Even if no mineral oil comes in contact with a belt, dust and centrifugal force will still cause dry rot. Any leather belt operating under normal atmospheric conditions will lose 30 per cent of its animal fat content during the first year of use. The second year 15 per cent of the remainder will be lost, and a somewhat smaller amount each succeeding year until the belt finally comes to an untimely end because of the ravages of dry rot brought on by starvation.

Prevention of dry rot merely calls for the periodic replenishing of the animal fats with such materials as pure beef tallow or neatsfoot oil. Analysis has shown that a leather belt will have lost ½ oz. of animal fat per square foot of surface one year after installation. If this amount is replaced the belt will, of course, lose a like quantity the second year. Therefore, the proper amount of belt dressing for a single-ply belt running under normal heat conditions is ½ oz. per square foot during each year of operation. A double-ply belt requires 1 oz. each year, one-half on each side. Three-ply belts need only the same amount as two-ply.

Belts Need Food

In the preceding paragraph, the term belt dressing was perhaps used too loosely. What the belt needs might be termed "food," in the form of pure beef tallow or pure neatsfoot oil. Not infrequently the belt user unknowingly buys belt dressings composed in whole or in part of such materials as tar, pitch, rosin, gum thus, mineral oil, and other materials. In some instances solvents are added to assist in working these materials into the body of the leather.

It would greatly assist buyers and prolong the average life of leather belting if the composition were given in full on every package of belt dressing. Some materials that are, or have been, used in belt dressings can be countenanced only because they do increase a belt's pulling power. But it is a needless and costly sacrifice to use dressings that tend to shorten belt life in order to increase the pulling power, when there are belt dressings on the market composed entirely of materials that are just as effective and at the same time, lubricate and preserve the leather.

COLORS Tell Which Oil When

R. J. MacMULLAN
Lubrication Department
E. F. Houghton & Company
Philadelphia

TRAFFIC CONTROL SYSTEMS use color to direct the operation of vehicles and it can be used with equal effectiveness in industry to control the oiling of equipment.

Through necessity many plants have to carry an extensive and complicated inventory of lubricants. Supervision of the many brands of oils and greases, and the education of the oilers as to when to put which lubricant where often becomes a headache.

Despite the progress which has been made in the simplification of varieties, because one modern lubricant can do the work or cover the range of several that are less efficient, there is still a need for special-purpose lubricants in almost every plant. How to keep them straight, when the drums look alike, is the question.

Use Two-Color Combinations

Many systems have been evolved to simplify the handling of oils, but too often the systems themselves have proved to be more difficult to follow than the methods previously employed.

Confusion regarding the characteristics and intended purposes of different oils may cause serious trouble. Hence, any system of distinguishing them must be effective and easy to follow. The system described here meets both of these requirements, is being used in several large plants, and is becoming more and more popular. It utilizes color as the means of identifying the oil to be used and the frequency of application. The principles on which it is based may be explained as follows:

1. Different colors are used to identify the various lubricants in use. For example:

Yellow indicates a general-purpose machine oil.

Blue indicates electric motor oils.

Green indicates speed reducer gear oils.

Purple indicates compressor oils.

2. Other colors are used to specify the period or frequency of application. For example:

Yellow indicates daily application.

Blue indicates weekly application.

Green indicates monthly application.

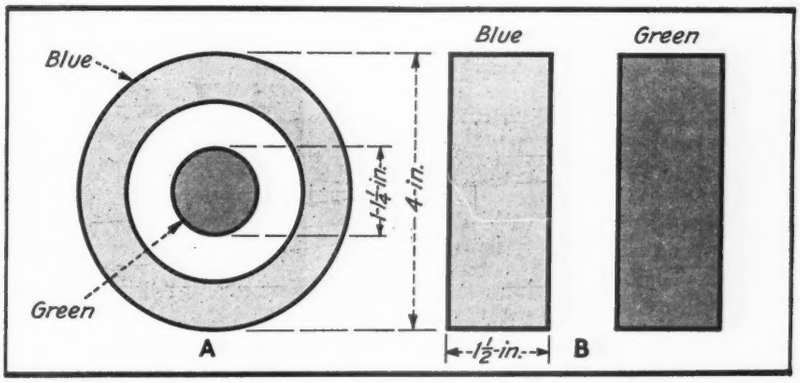
Red indicates danger spots on 1- to 8-hour shift periods.

Obviously, a machine marked with the bullseye shown at *A* in the illustration would require an electric motor oil monthly.

If preferred, the marking may be two vertical bands of color each about 4 in. long by 1½ in. wide, placed side by side. The left-hand band indicates the frequency of application and the right-hand, the oil or grease to be used. Thus, the marking shown at *B* would mean that the machine requires a speed reducer gear oil, and should be checked weekly, for adequacy of lubrication.

The system can, of course, be expanded or simplified to meet specific requirements of individual plants. As many colors can be used as are needed, and obviously they do not have to coincide with the examples given previously.

In many plants where the layout provides for whole sections containing identical machines lubricated with the same oil at the same time, it is not necessary to mark each machine individually. In such instances a metal tab



There's no guesswork when each piece of equipment is marked with a bullseye, *A*, or bands, *B*, whose colors show the kind of lubricant required and how often it should be applied

Having assigned the colors for type of oil and frequency of application the next step is to have the drums of the lubricant to which a color has been assigned, banded with that color.

Likewise, machines may then be marked in some conspicuous place with the color of the lubricant to be used, and with the color indicating the frequency of application.

A bullseye is probably the most effective design to use in marking the machines. The color of the inner circle indicates the frequency of applying the lubricant, while the outer circle shows the lubricant to be used.

A bullseye of the following dimensions is of convenient size and easily seen:

Over-all diameter, in..... 4
Middle circle diameter, in.. 2½ to 3

showing the correct colors for the oil to be used and the frequency of application may be hung at the entrance to the section, or at a conspicuous location somewhere in it.

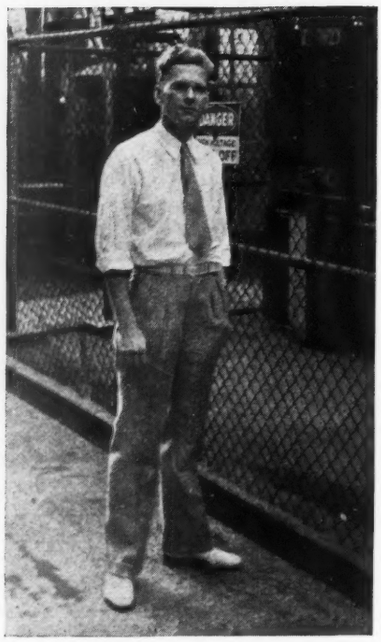
It is not suggested, of course, that the men in charge of oiling should rely entirely on their sense of color: they must be taught the lubrication requirements. However, this color guide will serve as a valuable check on their work, which is too often done in a hurry when it is easier to reach for the oil that happens to be closest to hand.

A system such as this will insure that the correct lubricant which was originally so carefully chosen, will be applied at the proper intervals. Costly mistakes due to guesswork and ignorance will be minimized.

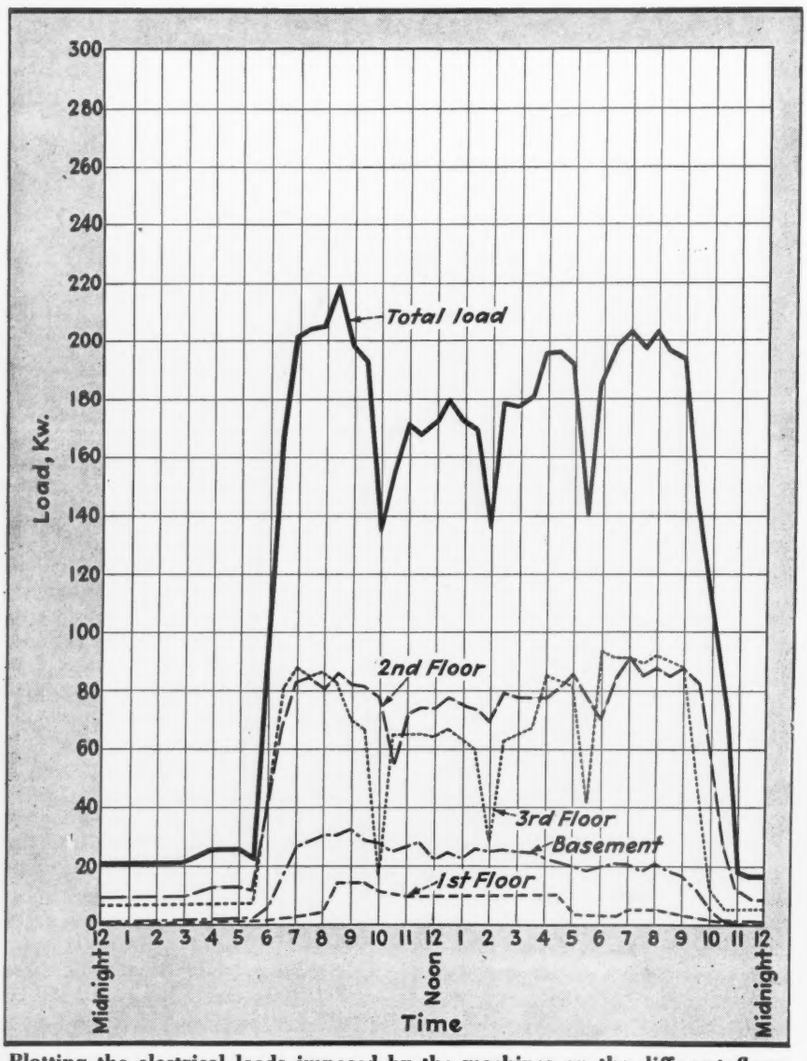
POWER BILLS Are Lower Now

All because of a survey that determined requirements, demand, operating characteristics, power factor, and size of motors

JAMES J. WENNER
Mechanical Engineer
The Williams Manufacturing Company
Portsmouth, Ohio



The author on the job



Plotting the electrical loads imposed by the machines on the different floors of this factory showed exactly where and when the power peaks occurred

CHARGES for such services as power, light, gas, and water, are a sizeable item of expense in most manufacturing plants, but usually they are paid each month without much thought, if any, being given toward reducing them. Particularly is this true of electrical energy charges. The average small plant that does not employ a trained electrical engineer hesitates, out of ignorance, trying to do something about reducing these costs. It is true that most plants have signs posted reminding employees to turn off the lights when not in use, but even when such instructions are implicitly obeyed they may yield only a small saving.

On the other hand, a well-conducted survey to determine power requirements, demand, plant operating characteristics, power factor, the proper size of motors for process machinery, and so on, will usually disclose ways of reducing power costs by an appreciable amount.

The Local Utility Helped

The desire to do something about reducing power charges is the first requisite. If no one having the required training is available in the plant, the services of a consulting engineer can be secured for a small fee. Many large electrical supply houses have trained men who can be called upon for advice. Probably the best source of trained engineers, supplied with the necessary instruments, is the utility companies. We took advantage of the help the local utility

could give and as a result were able to make a substantial monthly saving in our power bill.

This plant manufactures ladies' low-priced shoes. Electrical energy is consumed by a large number of small motors, lights, and a small heating load. During the winter the monthly electrical energy consumption of about 72,000 kw.-hr. is divided approximately as follows: power 55 per cent, lights 40 per cent, heating load for process work 5 per cent.

In summer the energy consumption is about 47,000 kw.-hr., which is divided about as follows: power 60 per cent, lighting 32 per cent, heating load 8 per cent.

As a result of the use of a large number of small motors, about 300 in all, running idle much of the time, the over-all power factor was found to be low. About two years before the survey was conducted a 40-kva. bank of capacitors had been installed, which brought the power factor up to 85 per cent. The addition of a considerable number of motors brought the power factor down to an average of 76 per cent at the time the survey was made. This low factor, which we knew was penalizing us, prompted the investigation. However, as we got into this problem it became apparent that additional savings were possible.

Our plant is run on a two-shift basis. The first shift works from 6:30 a.m. to 2:30 p.m. and the second from 2:30 to 10:30 p.m. One production department starts at 8 a.m. and quits at 4. The office and machine shop work from 8 to 5. This schedule of working hours brought about a peculiar condition in the demand load which readily lent itself to reduction with a resulting saving, as will be explained later.

Our rate for electrical energy is determined by (1) peak demand; (2) power factor; (3) kw.-hr. consumption.

The peak demand is determined by the highest kw. reading during any 15-minute period during the entire year. Once established, it remains in force for a one-year period.

Power factor is based on the average power factor recorded during a month's period. The kw.-hr. consumption is determined also for a month's period.

Each Floor Has Its Circuit

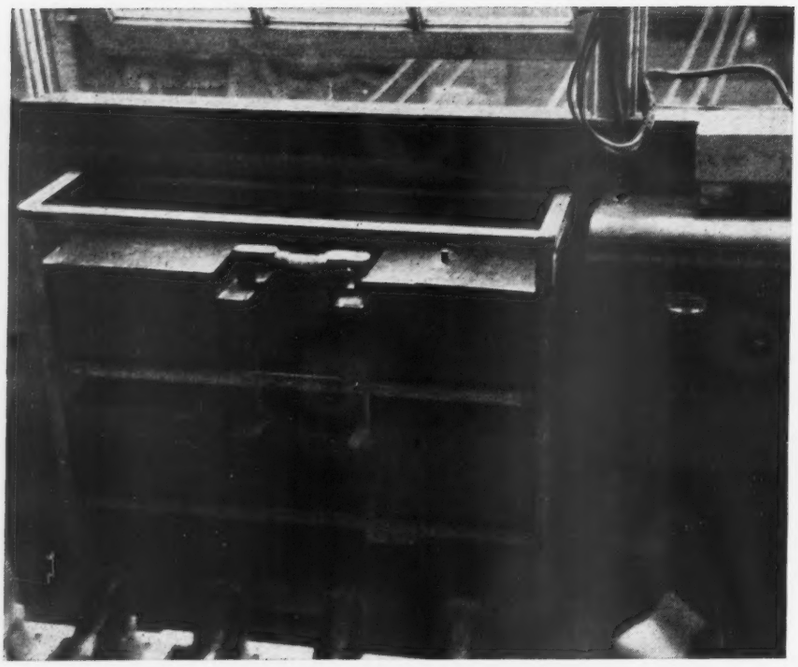
Our electrical wiring system is laid out so that each floor of the building is on a separate circuit, fed from the main power supply panel. In order to facilitate matters, tests were run for each floor separately. A better procedure would have been to run tests on separate departments, but it was impossible to do so.

Tests made on each floor consisted of recording on graphic meters the current, watts, and voltage on both power and lighting circuits for one week. From these data the power factor over the week's run was determined and plotted on a separate graph. This procedure was carried out throughout the entire plant. Finally the over-all power and light loads were recorded, and the power factor for the entire plant computed.

Next, a study mas made of the demand charts for two years back. These demand charts were in the files of the utility company, and are part of the data used in determining the monthly billing. It was found that our peak demand for the year occurred during the winter months. Further study revealed that this demand occurred regularly at about 8 o'clock in the morning. Since the power survey was conducted during the winter months, a study was made of the charts taken on the combined power and light loads. It was found that the peak loads occurred between 8 and 8:30 a.m., thus substantiating the indications on the monthly demand charts.

The next step was to find the cause of the peak demand occurring between 8 and 8:30 in the morning. Examination of all the graphic charts indicated that production was up to full capacity by 8 o'clock on all floors except the first, which contains the office and machine shop. As was mentioned previously, these departments start work at 8 o'clock. It was also

Plant power factor was low because much of the electrical load is in small motors, of which there are about 300



Many of the capacitors are used with individual motors, being thrown on the line only when the motor is running. An installation of four units is shown at the left. At the right is the contactor that controls operation of this bank

found that the lighting loads for all departments were at a maximum at that hour. Obviously, with the power and lighting loads at a maximum for all production departments, and the office and machine shop loads coming on at the same time, the total load pyramided to a peak for the day.

Having determined the cause of the peak demand, means of reducing it were next investigated. It was found that the machine shop load consisted primarily of a 15-kw. electric annealing furnace, used for heat-treating small metal parts. The office load consisted almost entirely of the lighting system. Further investigation of one production department revealed that an additional 15-kw. load came on at 8 o'clock when a section of this department started work.

It was not feasible to change the working schedule for the office, but there was nothing to prevent starting the electrically heated annealing furnace, and the section of the production department previously mentioned, at 9 o'clock. The result of these changes was a lowering of the peak demand at 8 a.m. by about 30 kw. without expense or any sacrifice in productive efficiency.

Our contract is based on the following formula:

Kva. Demand = (Kw. demand × 0.85) ÷ Power factor

Since the kw. demand had been reduced about as much as it could be, further lowering of the contract demand would have to be accomplished by raising the over-all power factor.

The 40-kva. bank of capacitors previously installed was permanently connected on the line. Observations on week-ends showed that this amount of correction gave 100 per cent power factor, being sufficient to take care of the small week-end load and transformer losses. It was deemed unwise to add more correction permanently on the line.

From the power factor charts that had been drawn up the amount of correction needed to raise the power factor to a desirable value and the proper location of the capacitors in relation to various departments were next determined. It was found that an additional 120 kva. of corrective capacity was needed in order to bring the power factor up to 93 per cent when operating at full load, representing a consumption of 72,000 kw.-hr. per month.

Capacitors were wired into the pushbutton control circuits of large motors and placed at a distance from main feeders, wherever possible. This arrangement serves to maintain the desired voltage even at outlying points of the wiring system. Also it insures that the capacitors are on the line only when the motors are running, thus preventing a leading power factor when the plant load is not up to its maximum value. However, there were not enough of these motor-capacitor applications to take care of all of the capacitor units; therefore it was necessary to group some of them in banks near the main feeders. These banks are thrown on and off the line by a contactor, controlled by a pushbutton which in turn starts and stops a conveyor in one of the production departments. This conveyor was chosen because it operates only when production is at a peak.

Because the survey was completed at the end of the winter months, during which time the consumption of electrical energy is at its highest point, it was decided to install only about 60 kva. of capacitors so as to raise the power factor during the summer months to 95 per cent. However, all switches, wiring, and racks for the full number of capacitors were installed at the start. As the winter months approach the remainder of the capacitors will be wired in the circuits. By handling the installation in this way we were able to cut down the initial expenditure and still obtain the maximum benefit from a lowered demand and higher power factor.

After the necessary equipment had been installed and the kw. demand reduced by changing the time schedule of various operations the following load characteristics were established:

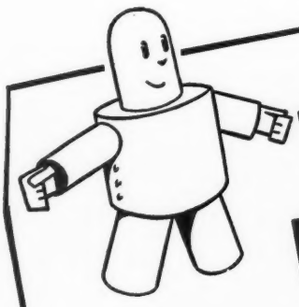
1. Contract demand was reduced from 275 to 200 kva.

2. Power factor was raised from 76 to 97 per cent for the average summer power consumption of 47,000 kw.-hr. per month.

Savings, $63 a Month

The saving made by lowering the contract demand and raising the power factor amounts to about $63 a month. These figures are based on an average summer consumption of 47,000 kw.-hr. per month. During the winter, when consumption averages 72,000 kw-hr. per month, the saving is about $122 a month. It is estimated that the capacitors and necessary equipment will be amortized in 20 months.

The installation of capacitors, primarily designed to raise the power factor, also yielded benefits in other directions. For example, voltage fluctuations caused by variation in power demands was minimized. Also, line losses were reduced. In addition, graphic charts taken during the survey brought out some interesting facts regarding the length of time required by the various departments to come up to full production, slackening of output before lunch periods and quitting time, and so on. These results were turned over to the production department for further study.

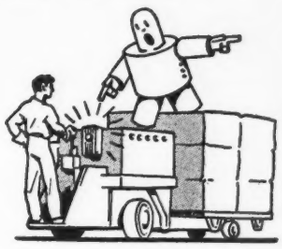


THE EXIDE ROBOT BATTERY TENDER

now guards the performance of electric industrial trucks

A new battery discharge and charge control system that

SIGNALS WHEN A BATTERY NEEDS RECHARGING



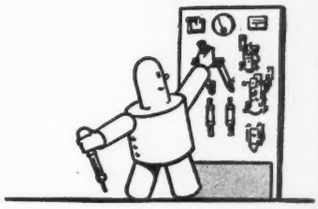
THE Exide Robot Battery Tender is a new discharge and charge control system embodying two recent Exide developments—the Exide Discharge Indicator which mounts on your electric truck, and the Exide Charge Control Unit which is installed on your charging panel.

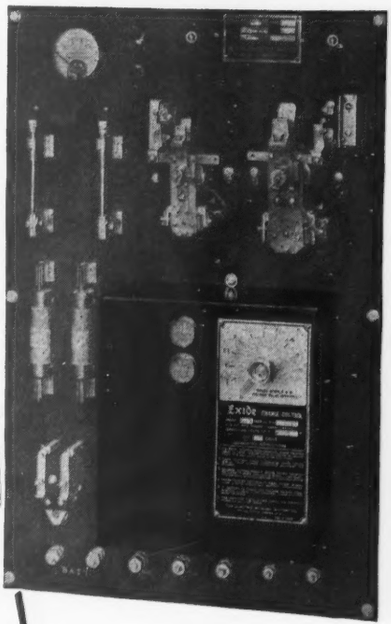
The Discharge Indicator flashes a red signal-light from the truck when the battery is approaching the discharge point and needs recharging or replacement with a freshly charged battery. No longer can your trucks "drag their feet" or run low in power without warning.

The Exide Charge Control Unit automatically controls the recharging of any Exide-Motive Power Battery of any number of cells up to 66, and can be used for either two-rate or taper charging. All that is necessary is to insert the charging plug and reset the control knob on the unit. A white signal-light on the unit flashes on, indicating that charging has begun.

At the proper point, the unit reduces the charging rate—automatically. And when charging is complete, the white light is extinguished and a green light appears. This is your "go" signal, meaning that the battery is ready for service and that the charging circuit is available for another battery. These two new Exide developments mean a real improvement in electric truck performance which will result in better material handling and lower cost. Write now for further details.

CONTROLS THE RECHARGE . . . . AUTOMATICALLY





Exide IRONCLAD BATTERIES

With Exide MIPOR Separators

"MIPOR," Reg. U.S. Pat. Off.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

You want to know

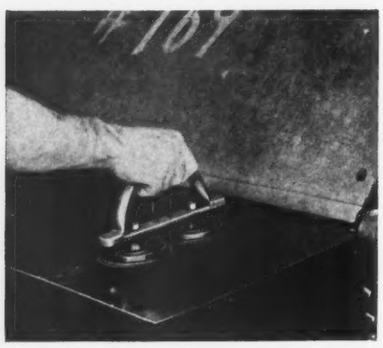
more about the items mentioned on this page.
Letters to the addresses given will bring information

• INDUSTRY'S APPROACH to deciding what each job is worth is becoming more scientific. Results of "A Survey of Job Evaluation as Used by Industry in Determining Base Rates" are published in a recent issue of the Bulletin of the National Association of Cost Accountants, 385 Madison Ave., New York.

• FLOORS will be treated to the luxury of dry cleaning with a machine whose two 10½-in. steel-wire brushes, revolving in opposite directions, produce a clean, non-skid surface on asphalt, brick, concrete, and composition floors. Lincoln-Schlueter Floor Machinery Co., Inc., Dept. M, 215-221 West Grand Ave., Chicago.

• ENVELOPE of thermoplastic sheet protects blueprints and shop orders handled roughly and often. Oil- and grease-proof, it is said not to become brittle with age. Curtis 1,000, Inc., 1,000 University Ave., St. Paul.

• STOPWATCH has knee action, which means that it is made with coil springs



IN THIS LIFTER manufacturers who are seeking faster and safer methods of handling sheet metal, glass, and the like may find what they've been looking for. Giant rubber vacuum cups have automatic releases that work with a flick of a finger. The Bastian-Blessing Co., 242 East Ontario St., Chicago.

that control the function of the entire mechanism and prevent breakage. M. Ducommun Co., 580 Fifth Ave., New York.

• SCREWS are automatically fed to power screwdrivers by a mechanical feeder that delivers screws, one at a time, to the driving position. The attachment prevents the driver head from slipping out of the screw head. Automatic Machine Co., 100 Beech St., Akron.

• SAFETY finds one of its most faithful practitioners in the steel industry which, despite its hazardous fabricating procedures, is now one of the safest of industries. A booklet tells how this was achieved, what is being done to continue the record. American Iron and Steel Institute, 330 Fifth Ave., New York.

• WATER REPELLENT for fabrics maintains its efficiency through repeated laundering and dry cleaning. "Zelan" will last through the normal life of a garment and help it resist soil and beverage spots. E. I. du Pont de Nemours & Co., Wilmington, Del.

• DEAD STORAGE FILES, steel, protect time cards, correspondence, and valuable records that must be kept around for a time. Fire-resistant, they take space sparingly, thanks to a self-contained interlocking device. All-Steel-Equip Co., Aurora, Ill.

• PRESERVATIVE and water repellent for wood controls decay, sap stain, and termites; it retards shrinkage and swelling. A liquid, "Wood Tox" can be applied by the pressure, dipping, or brush method. Wood Treating Chemicals Co., 332 South Michigan Ave., Chicago.

• PAINT PRIMER applied directly over rust penetrates into the surface, surrounds each rust particle, and prevents further oxidation. No need to clean surfaces to the bare metal before painting. American Asphalt Paint Co., 43 East Ohio St., Chicago.

• AIR CONDITIONER, unit type, is intended primarily for home use, but it'll do a good job in small offices, too. It filters, circulates, and humidifies 300 cu. ft. of air per min. Home Comfort Co., Harvey, Ill.

• TELEVISION, a booklet of facts. General Electric Co., 570 Lexington Ave., New York.

• ALUMINUM as a heat insulator finds another application in aluminum-surfaced roofing and shingles. Ceramic granules coated with aluminum cover weather surfaces, reflect heat. Certain-teed Products Corp., 100 East 42d St., New York.

• HAND LAMPS, rechargeable, have beam candlepower of 12,000 and 25,000. Nickel-iron-alkaline storage batteries have estimated life of 6,000 hr., will provide 6 hr. of light per charge. Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh.

• BELT DRESSING, colorless and odorless, should be welcome in canning, meat packing, and dairying. Belt Grip Co., 567 East 19th St., Paterson, N. J.

• WELDING CONTROL signals operator, by means of two tiny bulbs mounted inside his helmet, when selected voltage goes above or below point selected. A. O. Smith Corp., Milwaukee.

• MAGNETIC METAL "shivers" to operate temperature controls at any temperature between —150 and +1,100 deg. Magnets made of it and used for automatic controls lose or regain their magnetism with temperature changes, to operate electric switches. Battelle Memorial Institute, Columbus, Ohio.

• COMBINATION LADDER is step and extension ladders in one. As an extension it is twice the length of the step ladder, less 2 feet. Saf-T-Ladder Co., Green Bay, Wis.

• WATERPROOF CEMENT must be tough to be used in installation of airplane windshields and windows. There must be plenty of industrial applications for a cement like that. The B. B. Chemical Co., Cambridge, Mass.

SIX RANGES are combined in this clamp-ammeter which measures current flow through insulated or bare conductors up to 2¼ in. in diameter. Remote measurements up to 50 ft. can be made by removing the instrument from the assembly. Weston Electrical Instrument Corp., Newark, N. J.

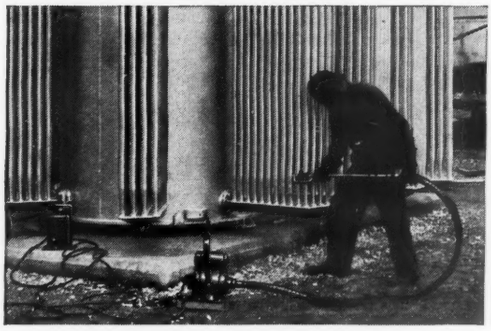
• VENETIAN BLINDS for office or plant are made of thin, washable cellulose slats which, while eliminating direct sunlight, are translucent and let filtered light come through. Their big advantage is claimed to be economy of their production. Warren Mfg. Corp., Warren, Pa.

• LAMP, incandescent, acts as its own diffuser through a treatment on inside of the glass that breaks up light rays of the filament and diffuses them inside the bulb. Wabash Appliance Corp., 335 Carroll St., Brooklyn, N. Y.

• FLARE LIGHTS, portable, operating on acetylene, are good to have around for occasional night work in remote regions of the factory yard where lighting cables aren't handy. The Alexander Milburn Co., 1493 West Baltimore St., Baltimore.

How to do it?

Many factory men have found these G-E maintenance tools helpful



TANK-AND-TUBE CLEANER

For preparing metal surfaces for repainting, you can't beat this tank-and-tube cleaner—a motor-driven device with a complete set of brushes and attachments. (We designed it for cleaning transformer tanks and tubes, but it has many other uses.) It's easy to use, and it might pay for itself on the first job. Ask for publication GEA-3014.

PORTABLE OIL TESTER

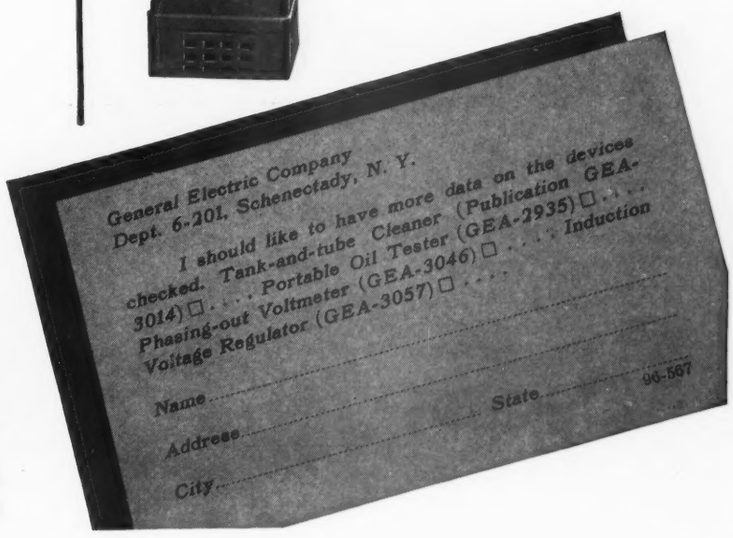
Test your oil regularly. That's the one way to make certain of its dielectric strength and thus help assure successful operation of high-voltage apparatus. This new device provides you with a convenient and accurate means of testing. It weighs only 78 pounds. See publication GEA-2935.

PHASING-OUT VOLTMETER

"What we need is a light, sturdy, high-voltage voltmeter for phasing-out distribution circuits and transformers." Have you ever heard this? Here is an instrument to meet the need. Just another helpful tool in General Electric's complete line of testing instruments. Remember, whenever you need an electric measuring instrument, General Electric has it. Ask us today for publication GEA-3046.

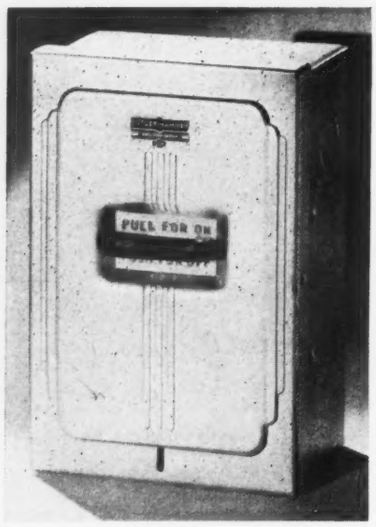
NAME YOUR VOLTAGE

Turn the crank and you have the voltage you specify. This new, hand-operated induction voltage regulator is just what you need for testing. It gives 100 per cent raise and 100 per cent lower—zero to 240 volts from a 120-volt circuit. Comes in handy on the production line or for repair and maintenance work. Send for publication GEA-3057.


General Electric Company
Dept. 6-201, Schenectady, N. Y.
I should like to have more data on the devices checked. Tank-and-tube Cleaner (Publication GEA-3014) ☐ . . . Portable Oil Tester (GEA-2935) ☐ . . . Phasing-out Voltmeter (GEA-3046) ☐ . . . . Induction Voltage Regulator (GEA-3057) ☐ . . . .
Name
Address
City
State
96-567

GENERAL ELECTRIC

What's New in Equipment



Inclosed Switch

"D-Puller," a front-operated Type D inclosed switch, operates on the "push-pull" principle. Rated at 30 amp., having devices for 2- and 3-wire solid neutral service, and 2-pole, 250-volt switches, they are available with and without removable dead-front plates. Constructed with solderless connectors on the line side, special wire holes on the terminal side, and several knockouts. Case is 7½ x 5 x 2¾ in. Finished with rust-resisting aluminum. Cutler-Hammer, Inc., 253 North 12th St., Milwaukee.

Pipe-Ventilated Motors

Motors for plants where moisture, dust, and vapors are present. Are totally inclosed and pipe-ventilated to insure clean, cool running. Construction features: "Mica-Bestos" insulation to protect the windings; "Herringbone" rotor for good performance. Pipe-vent attachments are available for conversion of Standard Sterling motors to pipe-ventilated type. Sterling Electric Motors, Inc., 5401 Telegraph Road, Los Angeles.

Speed Controller

Multi-step speed controller for a.c. motors facilitates variations in motor speed by changing input voltage, and permits operation by a thermostat or automatic switch because it insures re-starting of motor regardless of controller setting. Custom-built in wall mountings, mountings in a ventilated cabinet, mountings on the motors themselves, to suit customer's needs. Available in any desired method of voltage control. Raytheon Mfg. Co., Waltham, Mass.

Starter

Magnetic switch for use with single-phase motors, is available in ratings of 3 hp. at 110 volts, 5 hp. at 220 volts, and 7½ hp. at 440 volts. Consists of general-purpose 4-pole magnetic switch with two poles connected in parallel. This arrangement makes the device equivalent to a 2-pole switch with one overload relay. Application limited to use with motors whose normal full-load current does not exceed 30 amperes. General Electric Co., Schenectady, N. Y.

Electric Handsaw

Model K-10 "Speedmatic" electric handsaw with a 10-in. blade, cutting capacity of 3¾ in., speed of 4,000 r.p.m., is now available. Helical cut gears are used. It is a one-hand saw. A variety of cutting depths and angles are possible; setup is quick; locking is positive. A large base permits resting saw on the work. It is equipped with a rip gage that can be set to required distance so that it guides the saw from edge of stock. Gage can be turned out of way when not used. This saw can be used on the company's "Radial Arm" unit, which provides a cutoff and rip machine. The Porter-Cable Machine Co., 1714 North Salina St., Syracuse, N. Y.

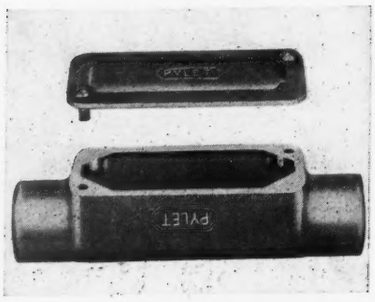
Counting Machines

Series of "Productimeters," including stroke and revolution counters in twenty variations, have dust-tight metal covers and shafts that run on oilless bearings.

Has louvered windows and all-metal number wheels with large black figures on white background. Available in stroke or rotary models; non-reset, wing nut or tumbler lock reset; operating levers on left or right; shaft extensions on left or right, or both ends; five or six figures; rotations clockwise or counter clockwise. Durant Mfg. Co., Milwaukee.

Conduit Fittings

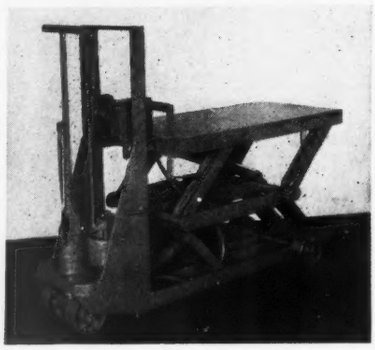
FS and FD series "Pylets" for railway and industrial electrical equipment in-



clude standard types of threaded conduit fittings. Malleable iron bodies are galvanized and finished with baked aluminum, large wiring space is provided, rounded edges of cover openings prevent chafing of wires, top surfaces are ground for accurate seating of covers, cover screw holes are counter-bored for self-alignment of covers. These fittings are made with square corners to take standard switch and receptacle plates. The Pyle-National Co., 1334-58 North Kostner Ave., Chicago.

Elevating Table Truck

Truck with hydraulic elevating table for handling sheet metal in feeding various types of machines—shears, presses, punches—may also be used for handling



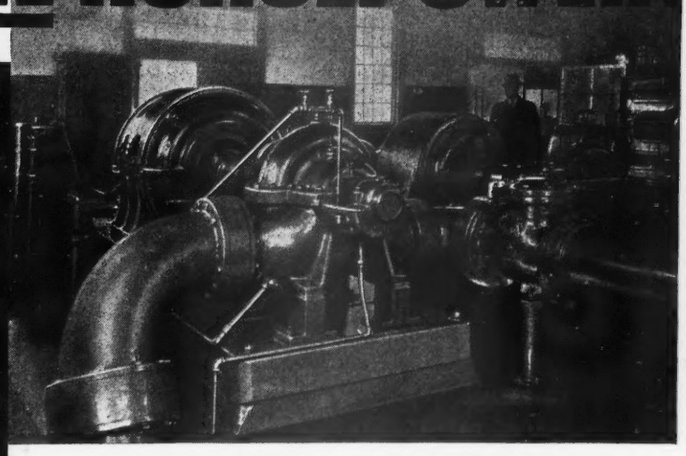
heavy rolls in and out of rolling machines, and dies in and out of presses. In elevating the table a two-speed hand-operated hydraulic pump is used. A winch may be mounted on front end of table. The table is 24x48 in., has a lowered height of 20 in., may be elevated to 43 in. A variety of sizes and of lowered and elevated heights are available. Lyon Iron Works, Greene, N. Y.

Valve Control

Type JS "Limitorque" control operator consists of a motor-driven combination helical and worm gear reducing mechanism bolted to a pad on side of valve yoke. The output shaft is connected to valve stem or yoke nut through a pair of spur gears. A "lost motion" device built into the machine allows motor to attain full speed before stem load is encountered. Valve can be manually operated by turning the de-clutch handle. "Limitorque" is applicable to gate, globe, plug, butterfly valves and

1,000,000 MORE GALLONS PER DAY WITH THE SAME HORSEPOWER!

Read the Sensational Story of How Pueblo, Colorado, Jumped Up Its Delivery of Water a Million Gallons a Day . . . At No Extra Cost for Power! Find Out How You Can Make Similar Savings . . . by Modernizing with Allis-Chalmers Pumps!



THIS NEW Allis-Chalmers Centrifugal Pump uses no more horsepower than the 20-year old pump it replaced . . . and yet it delivers a million gallons of water more per day! A. H. Wagner, Water Works Superintendent of Pueblo (standing back of the pump), tells this remarkable modernization story.

Here are facts that tell you their own story . . . facts that should make you ask yourself if YOU are getting modern efficiencies and lowest costs from your pumps!

Twenty years ago, in Pueblo, Colorado, a pump was installed . . . at that time the most advanced, most efficient pumping equipment on the market. Since then, this pump has done its job well, delivering water from the Arkansas river to the city of Pueblo at a reasonable cost. But to A. H. Wagner, Public Water Works Superintendent, this was not enough. He believed that modern equipment would give better results. In the fall of 1938, he replaced the 20-year old unit with a new, up-to-date Allis-Chalmers Centrifugal pump . . .

And when they hooked up that new pump and examined their meters . . . here's what they found! They found they were delivering a million gallons of water more . . . every day . . . with the same horsepower . . . at no extra cost!

Dollar-saving performances like these are the best kind of figures you can show your city or plant! If you are now using old pumping equipment, it will pay you to learn the modernization story of Allis-Chalmers equipment . . . and how you can show savings like these!

More Water at Less Cost!

For over fifty years Allis-Chalmers has been making pumps with the two-fold engineering aim of providing equipment that will deliver more water at less cost! In municipalities and industrial plants all over the world, Allis-Chalmers pumps are helping water supply engineers to cut pumping costs . . . reduce overhead . . . increase efficiencies and profits! Allis-Chalmers Pumps can help you, too, and give you dollar-and-cents savings in your plant!

Find out the facts today about getting the right kind of pump for your work! In the Allis-Chalmers district office near you is a trained pump engineer with interesting and important performance facts about pumping equipment that you should know. Get in touch with him . . . learn how much you can save . . . what modern Allis-Chalmers pumps can do for you! It Pays To Modernize With the Equipment that Pays for Itself!

1021

CENTRIFUGAL PUMP DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

SINGLE-STAGE DOUBLE-SUCTION PUMPS • CLOSE-COUPLED SINGLE-STAGE SSUnit PUMPS • MULTI-STAGE PUMPS • PAPER STOCK PUMPS • MIXED FLOW AND AXIAL FLOW PUMPS • AND SPECIAL DESIGNS FOR UNUSUAL APPLICATIONS

other applications. Variations in speed and torque are obtainable. Valve is available in sizes from 2-6 in., operating pressures from 350-55 lb. A ¼-hp., 110-volt, universal type a.c. or d.c. motor is standard with operators. Philadelphia Gear Works, Erie Ave. & G St., Philadelphia.

Signal Control Switches

For control of audible or visual signals to indicate predetermined time periods, these switches have two light-duty contact mechanisms for control of hour and minute at which signal or alarm is to be given. Hour is controlled by adjustable fingers on 24-hr. dial, minute by a cam on 60-min. dial. Signals of 2–25 sec. duration can be controlled exactly to the minute. Three types: SYC, synchronous, for use on regulated a.c. having practically no current interruptions; SMC, hand wound, with 40-day, 13-jewel precision clock mechanism for d.c., or a.c. where power interruptions are frequent. SEC, electrically wound, with automatic, 13-jewel precision clock mechanism for d.c., or a.c. where power interruptions are frequent. R. W. Cramer & Co., Inc., 67-69 Irving Place, New York.

Joint Covers

"Perfection" joint covers protect joints in copings, parapet walls, and projecting courses against frost and moisture. Constructed of lead-coated copper, designed and shaped from one piece of metal, self-centering and self-anchoring, the cover is made to expand with the shrinkage of the stone and mortar and thus maintain a positive seal at the joints. Special mastics or compounds for setting the covers are unnecessary. Can be applied to joints in old buildings. Dusing & Hunt, Inc., 1927 Elmwood Ave., Buffalo.

Toilet Seats

Made of bakelite and stainless steel with contact area minimized, this seat practically eliminates all danger of infec-

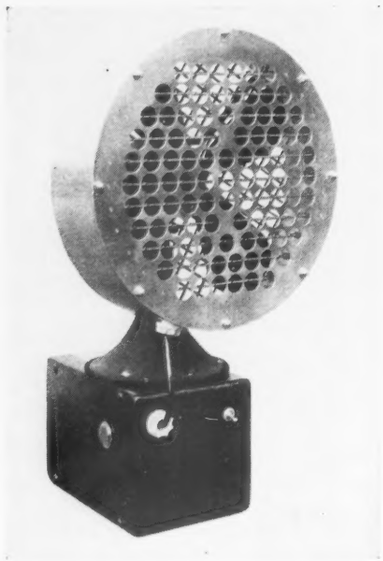
tion. Surfaces are smooth, rounded, and completely accessible for cleaning; corners and crevices are eliminated. Affords full support. Special tissues to put on seat arms are available. G. H. Tennant Co., 1821 Marshall St., N. E., Minneapolis.

Dynamotor

Model C20 dynamotor with filter has a special method of locking the brush caps and a device to stop end play in the armature shaft. Substantial reduction in ripple voltage and better regulation are claimed by the manufacturers on the basis of the introduction of a stronger magnetic field permitting an armature of smaller size and weight with lower resistance. Eicor, Inc., 515 South Laflin St., Chicago.

Static Eliminator

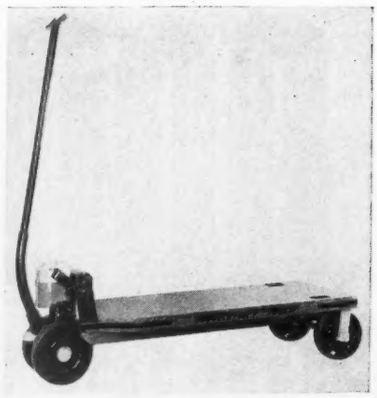
For producing high concentration of ions in air, a static electricity neutralizer that can cover air outlets or be furnished mounted in front of a fan, is available. Static bars with sharp points are mounted on the back of a flat metal plate that has closely spaced holes drilled in it. The bars are insulated from the plate and are charged by means of a special power unit that produces either a



plus, minus, or both plus and minus potentials, alternately. Air passing through the holes is highly ionized and capable of removing electric charges from any material, vapor, or the atmosphere itself at a distance of ten feet or more. Practically no ozone is produced by the ionizing plate. Applicable in prevention of fires in rotogravure processes, in manufacturing processes where highly inflammable or explosive vapors are present. The Simco Co., 4929 York Road, Philadelphia.

Temperature Regulator

Suitable for any temperature from —40 to +650 deg. F., Type SE temperature regulator can be calibrated for any desired temperature and then set 50 deg. higher and lower. The valve is of the throttling type and adjusts automatically to any position between wide open and closed. Sensitivity of regulator is adjustable in use. Operates from single-phase a.c., 110 or 220 volts, 60 cycles. Sizes: ½–4 in. Pressure range: single-seated valve, 175–15 lb.; double-seated valve, 175–125 lb. Sarco Co., Inc., 183 Madison Ave., New York.



Lift Truck

Single-stroke lift truck, available in 2,000-, 2,500-, 3,500-, and 5,000-lb. capacities, lifts mechanically and lowers with a heavy-duty hydraulic check operated by a pedal in front of truck. Setscrew makes adjustment of oil pressure in cylinder possible. Has a complete "handle-to-side" lift. The handle pivots from center of front axle; the grip turns in the handle. Front wheels are 10 in. in diameter, wide-spaced. All wheels carry Hyatt roller bearings or sealed ball bearings. Links are equipped with oilless bushings. Built so that one man can handle loads up to 3,500 lb. The Service Caster & Truck Co., 434 Somerville Ave., Somerville, Mass.

Insulation Tester

An insulation tester with maximum output of 2,500 volts. It indicates whether or not there is a short, ground, or broken wire. Is suited for testing insulation of low-voltage equipment. Current-carrying parts are carefully insulated. Safety features include a 3-wire primary cord, spring-operated cover over high-potential secondary test points, and a red indicating lamp. Ideal Commutator Dresser Co., 1416 Park Ave., Sycamore, Ill.

Relay

The "Microtrol" relay, housed in a weatherproof case, is a combination of the "Sensitrol" relay 705 that operates on values from 2 microamperes up and from 0.5 millivolts up, and power relay 712 handling 5 amp. at 110 volts a.c. non-inductive. It is an automatic, self-contained unit designed for an operating interval in which the power relay will open and close once each 4 sec. (closed 3 sec., open 1). Time intervals can be

For Dependable Bearings

THE EUCLID CRANE & HOIST COMPANY, Euclid, Ohio, are the builders of the 4-ton heavy duty monorail hoist illustrated. Equipped with Hyatt Roller Bearings throughout.

Depend on Hyatt

Long, smooth, dependable performance is Hyatt's contribution to the efficient handling and movement of materials for nearly half a century. You'll find Hyatt Roller Bearings doing their work of conservation in cranes, hoists, cars, trucks, and conveyors everywhere . . . running easily, accurately, and economically . . . guarding against waste, wear, maintenance, replacements, and shutdowns. We point to their wide use today by leading equipment manufacturers as further evidence of the fine performance of these dependable bearings. Hyatt Bearings Division, Harrison, New Jersey, San Francisco. Hyatt Roller Bearing Sales Company, Chicago and Pittsburgh.

HYATT *Roller Bearings*

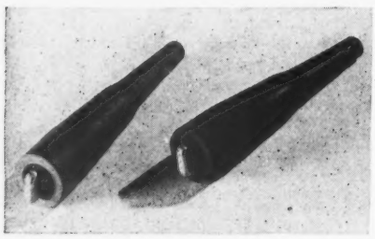
changed on order. It is intended for use on 120-volt, 60-cycle circuits. Can be supplied for any commercial frequency at voltage ranges from 12–250 volts. Applicable to control of automatic doors, alarms, temperature controls. Weston Electrical Instrument Corp., Newark, N. J.

Snap Gage

Model 1330 adjustable snap gage shows exact size variation directly. Jaws have tungsten carbide inserts. The upper jaw is adjustable for size of work; lower jaw is one end of a lever, opposite end of which contacts the indicator point directly, thus making possible a direct transfer of lower jaw motion to the indicator. Face of back stop automatically centers work for different diameters. Capacity 1–2½ in. Gage can be adjusted for diameters outside its capacity. Federal Products Corp., 1144 Eddy St., Providence, R. I.

Pressure-Reducing Valves

"Copes" valves, Types DBI, DSLH, S-1, and 3-SH-2C, for steam and water pressure reducing service. DBI is direct-operated, spring-loaded, and controls pressures from 2–50 lb. Regulation from fully-closed to wide-open is not more than 10 per cent of controlled pressure, not less than 0.5 lb. Comes in ¾- to 10-in. sizes in 125- to 300-lb. pressure standards. DSLH is relay-operated, spring-loaded, controls pressures 2–50 lb. For use where the reducing valve is subjected to high excess pressure. Operates with pressure drops as high as 1,200 lb. Regulation not more than 5 per cent, not less than 0.5 lb. Sizes 1–14 in. are furnished in 125- to 1500-lb. pressure standards. S-1 is direct-operated, spring-loaded, controls pressures 15–250 lb. Regulation not more than 10 per cent, not less than 4 lb. Sizes ¾–14 in., 125- to 400-lb. standards. 3-SH-2C is relay-operated, spring-loaded, and controls pressures 15–250 lb. For use where there is a high pressure drop across the reducing valve; suited for excess pressures up to 1,200 lb. Regulation not more than 5 per cent, not less than 2.5 lb. Sizes 1–14 in. furnished in 125- to 1,500-lb. standards. Northern Equipment Co., Erie, Pa.

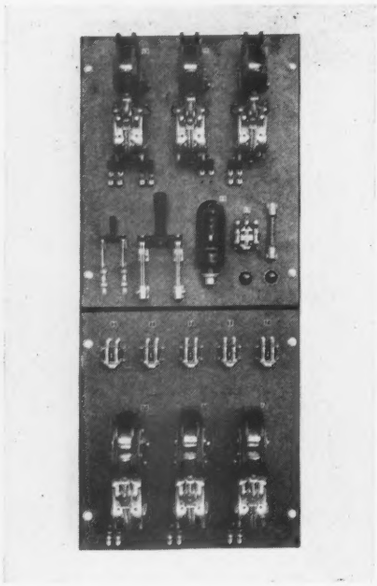


Test Clips

Insulated test clips that will not disintegrate when exposed to heat, oils, chemicals, and grease are made from neoprene. They will retain their strength, resilience, elasticity and abrasion resistance after extended exposure to oils, chemicals, heat, and aging. Mueller Electric Co., 1583 East 31st St., Cleveland.

Starters and Controllers

The "Neo-Time" acceleration principle is based on the time required to charge a



condenser to a predetermined voltage. An adjustable resistor placed in the condenser-charging circuit permits variations in time necessary to energize and close each successive accelerating contactor until the motor is operating on full line voltage. Applicable to drives requiring long time for acceleration—fans, saws, shears with flywheels. The starter illustrated permits a total acceleration time varying from 15 to about 160 seconds. The Electric Controller & Mfg. Co., 2700 East 79th St., Cleveland.

Indirect Lighting

MB Luminaries, designed for use with incandescent medium Bipost lamps, available in 500- and 750-1000-watt sizes, furnish indirect lighting. Construction consists of canopy drawn from 18-gage aluminum and stem of one-piece seamless aluminum tubing forming a swivel joint at the canopy. Standard, porcelain, Bipost lamp socket, is one-piece, easy to wire, and has all metal parts plated except the contacts which are unplated brass. The basin consists of outer and inner aluminum reflectors. The basin is suspended from the hanger on three steel rods spaced 120 deg. apart. Westinghouse Electric & Mfg. Co., East Pittsburgh.

Lift-Plug Valves

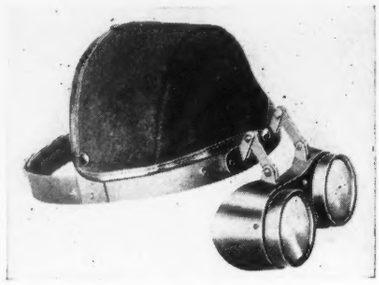
Three-way brass lift-plug valves for use on air, water, oil, and gas services at working pressures up to 150 lb., and temperatures below 400 deg. F. are available in 1¼- to 3½-in. sizes. Three styles of port arrangement permit flow from either end and out the side opening, or vice versa; from left hand end and out the side opening, or straight through; from right hand end and out the side opening, or straight through. Plug can be sealed in the body in either of its two extreme positions or in a mid-position closing all ports. Homestead Valve Mfg. Co., Inc., Coraopolis, Pa.

Bar Stock Truck

Safety type bar stock truck for handling steel bars, tubes, and similar material. Constructed of welded pressed steel, platform 20 in. by 12 ft. 6 in., height of platform 19 in. The platform has two wells to accommodate chains for crane loading, four stake pockets on each side, coupler on each end. Center balance wheels have 18-in. rubber tires; 9-in. caster wheels have Hyatt spiral type roller bearings and grease retaining washers. Balance type is of 2½-ton capacity. Weighs approximately 815 lb. Electric Wheel Co., Quincy, Ill.

Switch

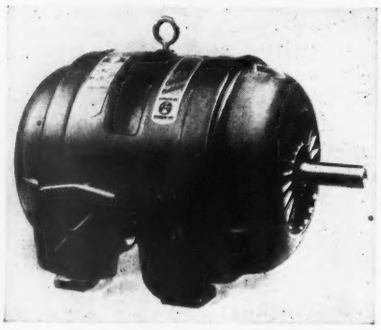
"Snap" switch of low operating pressure, short-travel type, is available in single-pole, normally closed, or normally open, double-throw types, and other variations. Designed to accomplish a quick make or break, it has a wide air gap with large contacts, measures $1\frac{7}{8}$ x $1\frac{5}{32}$ x $\frac{11}{16}$ in., and operates on a.c. and d.c. Operating force required to open or close switch ranges from 3–12½ oz. in the various types. Plunger movement ranges from 0.005 to 0.014 in. McDonnell & Miller, Wrigley Bldg., Chicago.



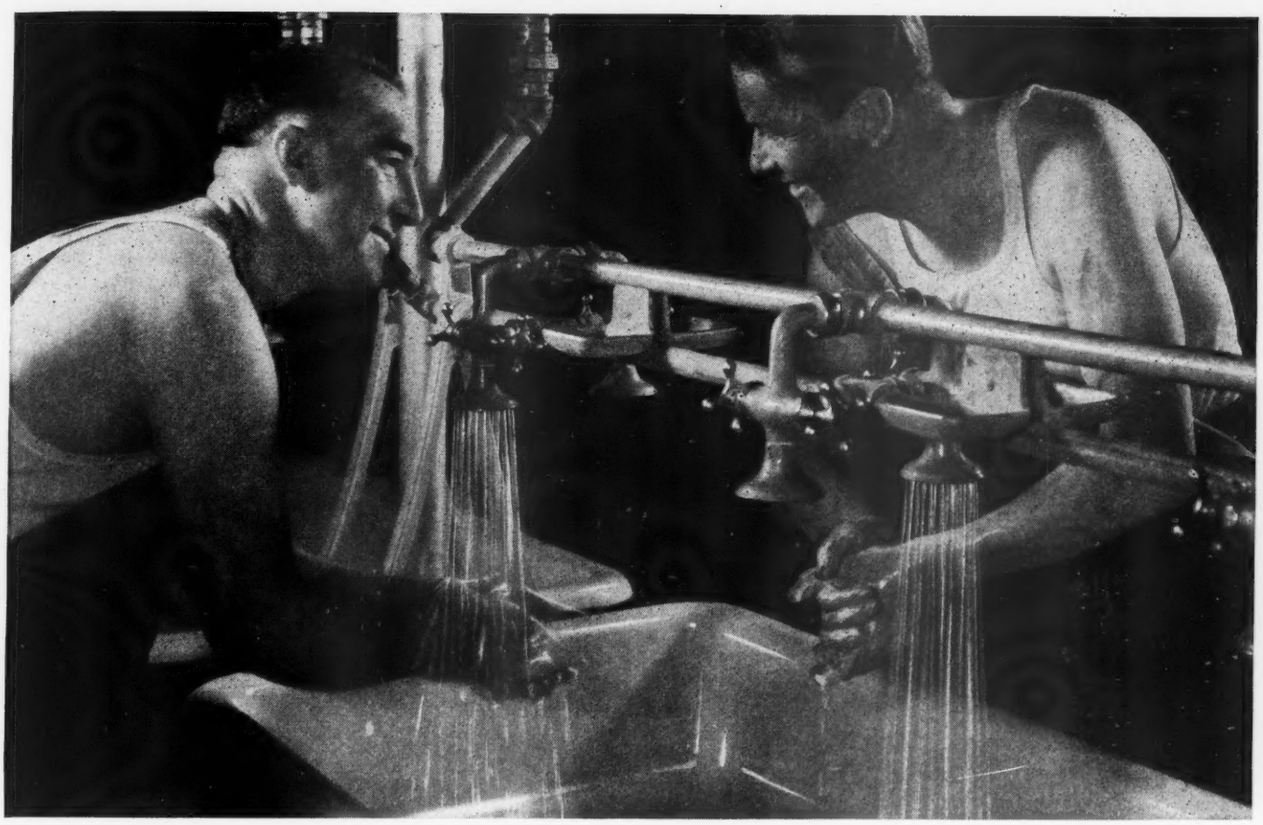
Goggle

For the welder who wears glasses, No. 225 goggle fits over the glasses, may be swung up out of the way without removing the headband or disturbing the glasses. Goggle frame is light in weight and attached to a headband by double hinges. The headband, attached to a fabric cap, may be adjusted loosely for comfort. Lens size is 50 mm., allows full vision, fits over all types of glasses, and is made to fit snugly to exclude chance light. Sellstrom Mfg. Co., 615 North Aberdeen St., Chicago.

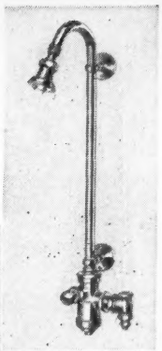
Explosion-Proof Motors



Line of explosion-proof ball-bearing motors for Class I Group D hazardous locations, can be applied to pumps, blow-



Crane has a complete line of showers for industrial use, with special features that assure not only a more refreshing stream, but water economy and durability as well. Illustrated is No. C-4742-G.



Trim and good looking, yet designed in every detail for industrial use, is this Crane No. C-11495 Speedway Closet. It is designed for easy cleaning—has a positive, vigorous flush—is economical of water.

Satisfied at wash-up time

. . . Ready for good work tomorrow

You can do a lot to encourage employees to smile at wash-up time by providing the right kind of sanitary facilities. Making their washing-up more convenient and enjoyable will go a long way in promoting better employee relations—a satisfaction that is reflected in improved efficiency.

Crane Co. has published a brochure on the subject of "Plumbing for Industrial and Commercial Buildings." It offers important aid in solving factory sanitation problems . . . gives help in choosing proper equipment. It explains the dangers to health of back-siphonage in plumbing installations, tells how to avoid them. Read this book to understand fully the many vital requirements of modern sanitation, and to know the advantages you gain by having plumbing installed by qualified licensed master plumbers only.

Crane Industrial Plumbing equipment includes conveniences that employees appreciate—as well as features that mean added value from the management's viewpoint. It is built to stand more than ordinary usage—with the sturdiness that industrial use demands. Why Crane Plumbing is a better investment for plants both large and small, is told convincingly in "Crane Plumbing for Industrial and Commercial Buildings." Mail the coupon for your free copy.

CRANE

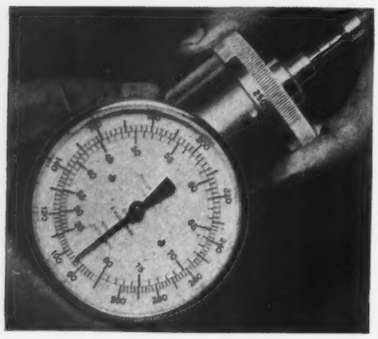
CRANE CO., GENERAL OFFICES: 836 SO. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE • PLUMBING • HEATING • PUMPS

CRANE CO. FM&M 2-39
836 South Michigan Ave., Chicago, Illinois
Gentlemen: I want a copy of "Crane Plumbing for Industrial and Commercial Buildings"—without obligation, of course.
Name.....
Street.....
City.....*State*.....

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING CONTRACTORS

ers, production machines, etc., as easily as any standard open motor. Has double-end ventilation. Symmetrical construction permits easy reversal of stator if necessary to change relative position of the conduit box. Type QZX. Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago.



Hand Tachometer

The "Twice Around the Dial" tachometer, available in two models, enables measurement of 25 to 30,000 and from 30 to 40,000 r.p.m. in three range changes. Operates on the centrifugal principle. The pointer makes two turns twice around the dial, reading on two sets of numerals—one for inside, the other for outside scale graduations. For use on motors, engines, shafts, and turbines, for paper and power plants. Standard accessories furnished. George Scherr Co., Inc., 128 Lafayette St., New York.

Crankcase Cleaner

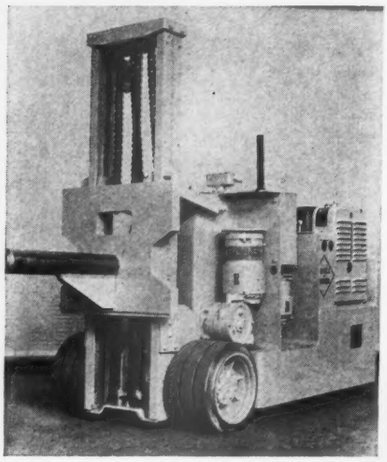
Oakite composition No. 9, an oil-soluble emulsifier, is designed for fast removal of sludge, grease, and carbonized oil deposits from diesel engine crankcases without scraping and wiping. Used with kerosene or light fuel oil, it is sprayed on, allowed to soak from 1 to 3 hr., then flushed away with a high-pressure rinse. Oakite Products, Inc., 22 Thames St., New York.

Lighting Fixtures

With colors so arranged as to approximate a duplicate of pure sunlight, this fixture for high intensity illumination, color matching, and inspection work, contains 80 feet of flourescent luminous tubing. Tubes are replaceable. The fixture can be suspended with rigid or chain chrome hangers. It throws a light intensity of 100 foot-candles over a relatively large area. Available in three sizes, 200- and 300-watt consumption, 110 volts, 60 cycles, single phase, a.c. Visualite Corp., Lima, Ohio.

Motor Pump

No. 212 centrifugal "Motorpump" supplies coolant for machine tools, light machinery, and other installations requiring a large volume at low head, and where dirt or abrasive may be present in the liquid. Motor is fully inclosed, is fitted with grease sealed ball bearings, and is cleared by a discharge pipe. The motor shaft is stainless steel; hydraulically-balanced, open-type impeller is aluminum bronze with case of cast iron. Water line on shaft indicates maximum submergence. The pump is powered to handle liquids up to 300 S.S.U. at operating temperature. Operates on a variety of commercial voltages and frequencies. Brown & Sharpe Mfg. Co., Providence, R. I.



Truck

Center drive ram and/or fork truck with rated capacities up to 14,000 lb. has 500 per cent overload, heavy-duty, and high-torque motor, high efficiency spiral bevel, and spur gear drive. The travel, lift, and tilt motions are controlled through a centralized contactor control system. The compensating-rocker-type trail axle is cushioned on rubber. Wheels are mounted on, and swivel in anti-friction bearings. A solenoid brake on the hoist motor locks load in position unless released by application of power. Regenerative braking supplements the solenoid brake and returns current to battery when lowering load. An electric clutch protects the mechanism at the limit of up travel and when overloaded. Equipped with wheel steer or power steer, and with battery or "ready-power" unit. The Elwell-Parker Electric Co., Cleveland.

Pipe Threaders

65R and 85R series pipe threaders of all-steel and malleable-alloy construction thread 1-, 1¼-, 1½-, and 2-in. pipes with one set of chasers. Offer a choice of cam and plate type workholders.

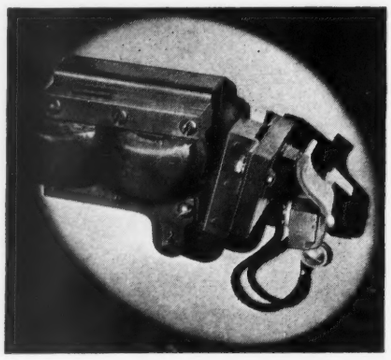
1R series poster pipe threaders of all-steel and malleable-alloy construction has 4 sets of chasers, full floating, separately replaceable posts, choice of cam or plate type workholders. Chaser dies fit any make of poster threader and all dies of same number are interchangeable with similar number of any other "Ridgid Poster" set. The Ridge Tool Co., Elyria, Ohio.

Tension Indicator

"Ammco" tension indicator provides "uniform tension" in tightening bolts to a predetermined stress, each bolt carrying its proportionate share of the load. Can be taken into the field for use. Available in three sizes: 2,100 in.-lb., 175 ft.-lb., ½-in. square work adapter; 5,000 in.-lb., 420 ft.-lb., ¾-in. square work adapter; 12,000 in.-lb., 1,000 ft.-lb., 1-in. square work adapter. Ratchet adapters are extra. Automotive Maintenance Machinery Co., 2100 Commonwealth Ave., North Chicago, Ill.

Soap Dispensers

"Gre-Solvent," long available as a paste, has been introduced in powder form so that it may be utilized more economically and in more sanitary fashion—from dispensers, which are also offered. The powder dissolves and removes from the hands machine grease, grime, printer's ink, and many chemical stains. The tamper-proof dispensers, which fasten flush to the wall with concealed screws, measure the quantity of powder released, a single operation of the plunger releasing just a certain amount. Made of heavy, pressed steel, the dispensers are finished in white or cream lacquer. The Utility Co., Inc., 636-42 West 44th St., New York.



Relay

Polarized field-frequency relay for synchronous motor control enables the motor to exert maximum effort in pulling its load up to synchronous speed in relatively little time. It purposes to eliminate backlash to the driven machinery and to reduce voltage disturbance on the power line during synchronization. Polarized action of relay makes it selective to apply field excitation at most favorable angle between stator and rotor poles of synchronous motor in pulling the motor into synchronism without pole slippage. The relay allows the motor to resynchronize by removing excitation automatically when a momentary voltage dip or overload pulls the motor out of step. Electric Machinery Mfg. Co., Minneapolis.

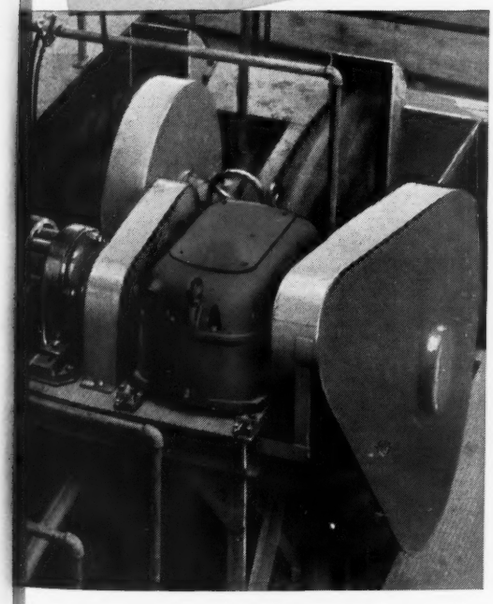
Electric Drill

The "Hornet," a lightweight ¼-in. drill for light work, weighs 34 oz. Built with splined gear mounting, ball bearings, screened air inlets, fan, grip-type

(Continued on page 96)

YES! SAVES TIME, POWER, SPACE, MONEY

Read Why It Pays To Use The Sensational New Allis-Chalmers Vari-Pitch Speed Changer . . . the Unit That Gives You Smooth UP or DOWN Speed Changing . . . Provides Increased Producing Capacity For Your Machines . . . Gives You Greater Manufacturing Profits!



Here is one of the eight 22 hp Vari-Pitch Speed Changers on the job at Grand Coulee Dam. Working with Allis-Chalmers motors and starters, these Speed Changers operate rake-type sand classifiers, providing low-cost speed variations to suit changing needs.

YES! Saves Time! You can save valuable production time by using the new Vari-Pitch Speed Changer . . . no stopping production while making necessary speed changes . . . no time-wasting change-overs! Get the speed you want . . . instantaneously . . . by turning the hand wheel. Or if you desire, electrical fingertip control is provided . . . a flick of the switch gives you extra-fast speed changes!

YES! Saves Power! The Allis-Chalmers Vari-Pitch Speed Changer is a power-saver! Tests under load show amazingly high efficiency ratings. Dynamically balanced sheaves . . . anti-friction bearings . . . long-life Texropes—all help plug power leaks and assure low maintenance.

YES! Saves Space! Space is worth money . . . now you can save from 2/3 to 3/4 of the valuable space ordinarily used by bulkier transmissions. Double-shaft extensions let you place this compact, highly flexible unit in the most space-saving spot to do the most efficient work . . . at a cut in overhead costs!

YES! Saves Money! Be sure you understand the full money-saving importance of the Allis-Chalmers Vari-Pitch Speed Changer! It eliminates the need for costly multi-speed motors or separate change-overs for each new speed. Be sure you know what it means to have a variable speed transmission that operates easily . . . instantaneously . . . economically! Be sure you have the facts on this money-saving, profit-making performance!

Send today for Bulletin 1266 or call the district office near you. Find out how much you can save in Time . . . Power . . . Space . . . Money . . . by using the Allis-Chalmers Vari-Pitch Speed Changer!

Vari-Pitch Speed Changers • Texrope V-Belts • Duro-Brace Texsteel Sheaves • Vari-Pitch Sheaves • Standard Cast Iron Sheaves • Adjustable Pitch Diameter Texsteel Sheaves • 2-3-4 Combination Sheaves • Straight-line Automatic Motor Bases • Oil Field Drilling Rigs

TEXROPE DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

1008 Belts by Goodrich

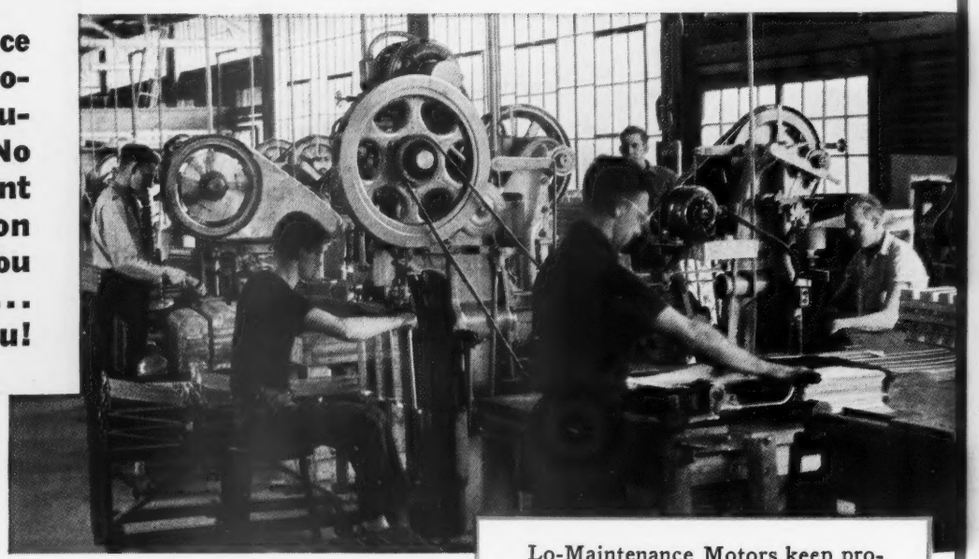
8½ YEAR REPAIR BILL

FOR 119 LO-MAINTENANCE MOTORS

$000.00!

Another true case history from the Allis-Chalmers files that proves **"IT PAYS TO BUY THE EQUIPMENT THAT PAYS FOR ITSELF!"**

Read the Sensational Performance Story of 119 Lo-Maintenance Motors . . . How They Ran Continuously for 8½ Years . . . With No Shut-Downs . . . and Not One Cent for Repairs! Get the Facts on the Full Measure Protection You Get with Allis-Chalmers Motors . . . on the Savings It Means To You!



Lo-Maintenance Motors keep production steady — without running up repair bills at the Lockwood Mfg. Co., Cincinnati, Ohio.

Here's a story that speaks for itself! And it strikes right home to every executive who is interested in keeping his production steady . . . in cutting costs in his plant!

When H. A. Lockwood, president of the Lockwood Mfg. Company of Cincinnati, bought 119 Allis-Chalmers Lo-Maintenance Motors, he knew from past experience that he was going to get good performance . . . but he never realized the amazing low-cost operating record those motors would set for him!

"We haven't spent one cent for repairs!"

"We feel," said Mr. Lockwood, whose company manufactures bakery pans and supplies, "that our motors are one of the most important parts of our production process. And you can readily see that for us motor failures are costly . . . in wasted operators' time . . . in production losses . . . in maintenance costs.

"That's why we are so enthusiastic about Allis-Chalmers motors. They've done everything you said they would do, and we haven't spent one cent for repairs on any of the 119 motors since we installed them 8½ years ago!"

That's why Mr. Lockwood ordered 33 additional Lo-Maintenance Motors to take care of expansion needs. And that's why in every industry . . . in plants throughout the country . . . plant managers are switching to Allis-Chalmers Lo-Maintenance motors! They know they get that extra margin of full measure protection that's built into every Allis-Chalmers Lo-Maintenance Motor.

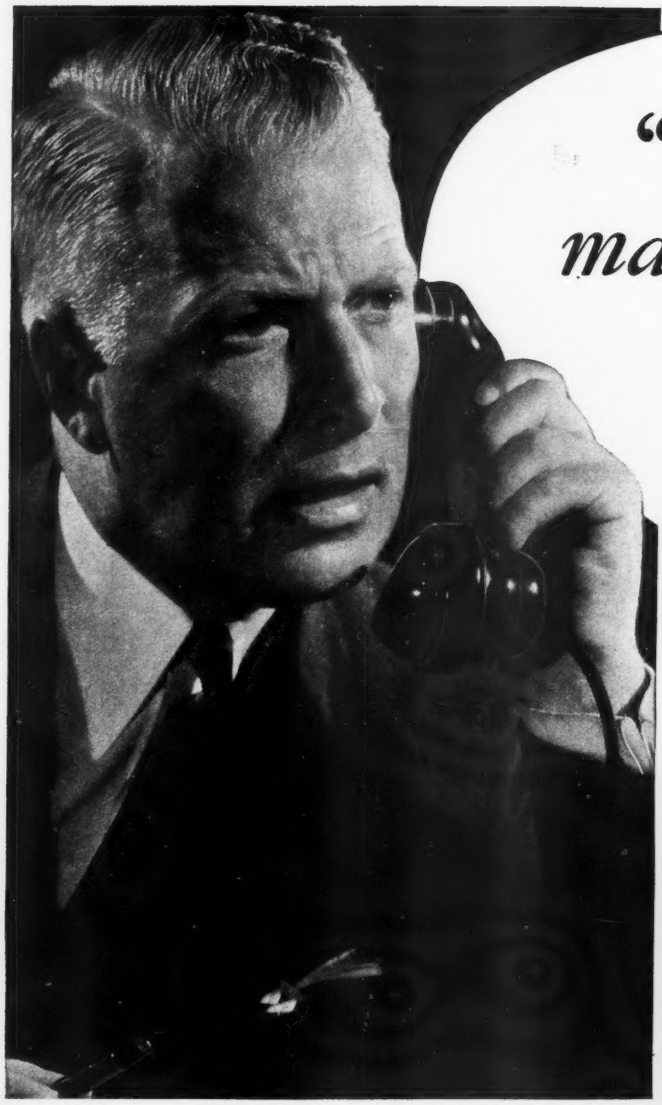
Husky, all-around construction with no skimping on material . . . high carbon steel frame . . . indestructible rotor and distortionless stator . . . that's a combination that beats costly repair bills, eliminates time-wasting shut-downs!

Get the story of how Allis-Chalmers' 90 years of advancing with industry works for you when you buy a Lo-Maintenance Motor! Call the nearest District Office or write direct to Allis-Chalmers. Find out how you can cut costs . . . keep production steady with Lo-Maintenance Motors . . . the motors that give you more than just a rated horsepower!

MOTORS FOR ALL APPLICATIONS
FROM ½ HORSEPOWER AND UP

ELECTRICAL DIVISION
ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

1033



"what! another *materials handling* accident... can't we *do something* about them?"

● The cost of a *single* accident can be *many* times the cost of replacing dangerous lifting elements! It doesn't pay to take chances; it *does* pay to have modern, safe, dependable equipment at all times.

For handling materials there's no better, no safer equipment than Macwhyte Braided Wire Rope Slings.

The secret of their safety lies in their patented braided construction made from right and left lay endless Monarch Whyte Strand wire ropes. These slings in addition to their safety features have:

unusual strength,
"hug" the load tight,
speed up handling.

They're extremely pliable,
light in weight,
easy to handle.

AND because they do the job easily, safely, speedily, month after month, they're ECONOMICAL, too!

For these reasons you find Macwhyte Braided Wire Rope Slings on duty in many of America's largest manufacturing plants.

MACWHYTE COMPANY
Manufacturers of
Wire Rope and Braided Wire Rope Slings
Main Office: KENOSHA, WISCONSIN
New York . . Pittsburgh . . Chicago . . Ft. Worth . . Portland . . Seattle . . San Francisco
(Distributors throughout the U. S. A.)

Member National Safety Council

Furnished Without Obligation:

1 *Expert Consulting Service.* Write us about *your* handling problems. Our engineers will study them, help you solve them, show you how to get better service at lower cost. This consulting service is furnished without obligation.

2 *How to Handle Loads Safely* . . . an on-the-job booklet showing how Macwhyte Slings solve materials handling problems of every kind, every day. Send for this free booklet.

NO. 284

MACWHYTE
Braided **WIRE ROPE** *Slings*

(Continued from page 92)

switch, universal motor, it has an operating speed of 3,700 r.p.m. with an optional speed of 5,200 r.p.m. The Black & Decker Mfg. Co., Towson, Md.

Lamp Diffuser Units

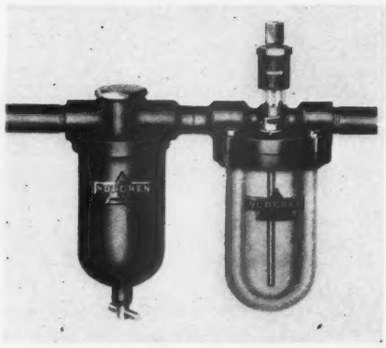
For use with "Daylight" white fluorescent lamps, the Benjamin "Daylight" fluorescent lamp diffuser unit is said to distribute uniformly a minimum of 100 foot-candles of daylight quality light of 6,500 deg. Kelvin color temperature rating over an area 3x4 ft. when a 36-in. lamp unit is suspended 30-36 in. above a surface. Available in two sizes: 36-in., using 30-watt lamps; 18-in., using 15-watt lamps. As the lamps are essentially mercury arc sources, auxiliaries necessary for operation on standard lighting lines are built into the units. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Elevators

"Oildraulic" elevators and other elevating devices with a travel of 30 ft. or less have been developed to meet the need for easy handling of materials in short rise elevations—between floors, different plant levels, onto the back of a truck, into a freight car. Operates on oil that returns to reservoir to be used again. Development of a seven-cylinder radial pump which works at high pressures permits use of relatively small jacks and thus reduces diameter of well hole required. Units with a travel of 5 ft. or less form part of floor or loading platform when in lowered position. Although an electric pumping mechanism is most popular, air operation is used for certain applications. The units are controlled by hand lever at the power unit, by the pull of a rope, by pushbuttons. Rotary Lift Co., Memphis, Tenn.

Circuit Breaker

Type M "Raintight Multi-breakeR" for outdoor applications of service entrance and auxiliary services has box of "galvaneal" steel with baked aluminum finish. Conduit hubs can be provided in top, bottom, or both, in sizes to meet requirements. Provision is made for sealing deadfront trim that covers wiring gutters, and for locking the outer cover. Offered with one, two, and three type-M units, making available one to six single-pole circuits, one to three double-pole circuits, or a combination of single- and double-pole. Furnished with either grounded or insulated neutral. Square D Company, Detroit.



Air Strainer, Lubricator

Combination air strainer and sight feed automatic air line lubricator conditions air for the operation of air tools. Strainer consists of a double screen (200-mesh monel metal, and 100-mesh brass), a bronze head, and a drawn steel, tin-dipped bowl. Offered in ¼- and ⅜-in. sizes. The lubricator has a transparent oil reservoir of resilient plastic which has withstood the 500-lb. burst test and is suitable for installations in temperatures up to 180 deg. F. An adjustable needle valve controls the oil feed and shows amount of lubricant being introduced to air stream. New lubricant may be added without any blow-back or spray even with the air line in use. Available in ¼-, ⅜-, and ½-in. sizes for horizontal lines. B. A. Norgren Co., Inc., Denver.

Respirator

"Dupor" No. 46 for lead dusts has a twin filter area of approximately 46 sq. in. Filters of felt are adjustable, removable, replaceable. The face piece is of soft rubber, light weight, and said to be air tight on any shape face. It does not prevent conversation or interfere with goggles. Can be folded to fit into wearer's pocket. H. S. Cover, South Bend, Ind.

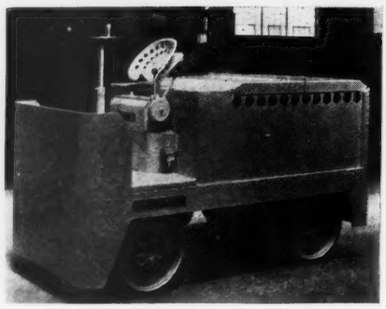
Face Shield

For workmen on spot, flash, or gun welding, in laboratories, on light grinding, die casting, for band sawyers, wire wheel operators, and those handling acids. No. 50 shield has a fiber crown, spark deflector, positive friction joint, replaceable sweat band, and plastacele windows that don't burn and are aluminum bound. Can be worn with glasses. Are available

in clear, amber, and green plastacele, or with wire screen fronts. The Boyer-Campbell Co., 6540 Antoine St., Detroit.

Flexible Coupling

For use in industries where explosive and flammable gases, vapors, and liquids are handled, the L-R "Safety" flexible coupling for handling misalignment, starting torque, absorbing shocks on direct-connected machinery, insures against sparking. Is of three-piece construction: two bronze flanges and one-piece resilient cushion spider of rubber, duck, leather, or brake lining material of woven asbestos. Needs no lubrication. Available in standard sizes with bores from 1-2¼ in., 2-90 hp. at 1,750 r.p.m. Lovejoy Flexible Coupling Co., 5009 West Lake St., Chicago.



Tractor

TQ heavy-duty tractor for hauling heavy loads on trailers has an ultimate draw bar pull of 3,500 lb., 4-wheel drive, and steer. Has 4-speed, heavy-duty, horizontal double drum, fully inclosed type drive controller that allows for dynamic brakes. Power circuit may be fully applied before releasing brake. No fuses are used in the motor circuit. Drive axles are equipped with 500 per cent overload, heavy-duty and high-torque motors. Motor is direct-connected to free coasting worm and gear. The drive units are supported at three points to compensate for floor irregularities and to relieve strains on the frame. The Elwell-Parker Electric Co., Cleveland.

Transformer

"Acme Safety" transformer reduces shock and explosive hazards in damp and moist buildings, in plants permeated with explosive vapors, fumes or dust, and around boilers, tanks, and other machinery. A portable unit, heavily insulated, it may be plugged into any 110-volt a.c. circuit. Dual polarized secondary receptacles provide for two 32-volt a.c. extension lines for inspection lights. Available in 60 and 25 cycles weighing 15 and 20 lb. respectively. The Acme Electric & Mfg. Co., Cuba, N. Y.

Cooling Water Control

Type TR-40 regulator, for use on the cooling water jackets of internal combustion engines and compressors, can be used in water cooling of solvent recovery stills and on degreasers. Consists of a piston valve operated by a liquid expansion thermostat. A bleeder port, adjustable from the outside, allows small amount of water to flow at all times and keep thermostat active. A fusible plug serves as a safety device,

(Continued on page 116)

GULF RESEARCH TECHNICIANS develop improved lubricants . . . help industry reduce operating costs!

PICTURED above is a typical scene in the Gulf research laboratories. Gulf technologists, in this instance, are working with an experimental Diesel engine, studying Diesel lubrication problems. Nearby, another exhaustive research goes forward on the lubrication of a modern type of textile spindle. In the next room a railroad car bearing is being run under precisely the speed and load conditions of actual service. And a host of other lubrication problems —many of them born of our rapidly advancing mechanical age—are being studied each day by Gulf's large staff of scientific men.

To what end is this extensive research work carried on? What is its objective? By perfecting better lubricants, and better methods of applying them, Gulf is doing its part to *help industry reduce operating costs*—save money on maintenance and power, improve production and make the machinery for which you paid real money last longer.

These Gulf technologists are examining pistons and rings removed from the experimental Diesel engine shown above, after an extended period of operation. They find that ring sticking, cylinder wear, ring wear, gum formation and objectionable deposits have been minimized by the proper use of the right grades of Gulf's higher quality Diesel lubricants.

Your machinery, old or new, will be better prepared to give you the efficient production you need when you protect it with Gulf's higher quality oils and greases. Available to you, through more than 1100 warehouses in 28 states, is Gulf's complete line of 400 quality oils and greases . . . and the services of an experienced Gulf lubrication engineer. Ask him to recommend proper lubrication for your equipment. GULF OIL CORPORATION, GULF REFINING COMPANY, PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

Biggest Jobs for 1939

(Continued from page 59)

and valleys—*Vice-president of a medium-sized company making printing equipment.*

11. Two Annual Sales Peaks

Our greatest single development has been the effort made to stabilize production throughout the year. We have a good history of sales over many years in the past, and know that we have two major sales peaks. What we have been endeavoring to do is to stabilize our production so we may keep it practically uniform throughout the year and yet not overproduce. At the same time we must have sufficient stock to take care of peak sales. The problem has been complicated because of the variety of units that make up our total volume.

Another problem we have been stressing is the procedure for controlling costs of maintenance work and tying it in with our production—*Manufacturer of hard rubber products.*

LARGE MFG. CO. SECURES DEFINITE SAVINGS
The Production Department of a leading manufacturer had been having fabrication difficulties with warehouse material. When improvement was urged, the Purchasing Department turned to Ryerson Certified Steel. The Production Department now reports lower costs and complete satisfaction.
MOTOR PLANT ELIMINATES TESTS
A large motor plant reports the Ryerson Certified Steel Plan helps them in two ways. First—when a certain heat treatment result is desired, they do not have to make preliminary tests of bars purchased. Second—they now check only one bar of a heat where before they ran tests on every bar received. This naturally represents a definite saving to them.
HELPS SECURE QUICK GOVERNMENT OK
A company specializing in government aviation work finds Ryerson alloy steel test reports enable them to get quick approval of steel by government officials and inspectors.
SHOP INSISTS ON BETTER STEEL
A contract shop quoted on a certain job with the customer furnishing the steel. They secured and completed the job, but took a loss on it because of non-uniform steel. The shop advised the customer that a higher price would have to be charged next time unless they furnished better and more uniform stock such as Ryerson Certified Steel.
USES CERTIFIED STEEL TO HELP SELL
One large company requested extra books on the Certified Steel Plan for use by their Sales Department, saying, "We believe that our own customers should know we are using Certified Steels."
RYERSON R CERTIFIED STEELS

THESE are but a few of the many stories that come to us every day, proving the advantages of using Ryerson Certified Steels. Since this higher uniform quality can be purchased without increased cost, we believe it will pay you to concentrate with Ryerson. Remember the steel is in stock and Immediate Shipment is assured. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Boston, Detroit, Cincinnati, Cleveland, Buffalo, Philadelphia, Jersey City.

***Principal products in stock for Immediate Shipment include*—Bars Structurals, Shafting, Plates, Alloy Steel, Tool Steel, Spring Steel, Iron and Steel Sheets, Stainless, Strip Steel, Welding Rod, Tubing Babbitt, etc.**

RYERSON *Certified* STEELS

12. Ready for the Next Boom

The big problem for production management, I believe, is to find a means of leveling off production loads to eliminate the high peaks and deep valleys which result in forced uneconomical production in the high peaks, and in unemployment and idle facilities in the low valleys. The answer may be to build up our inventories during the valleys and also provide new facilities, but to do this requires a great deal of courage, analysis, and study in order to provide apparatus that will not become obsolete because of later improved designs.

In 1937, our company experienced an unprecedented increase in business starting with January, and a most drastic decrease starting in September. This sudden overloading and underloading of our plants increased the problems of providing personnel, equipment, and materials for this peak and disposing of inventories when "the bottom fell out." Had we been able to foresee this condition a reasonable time ahead, we could undoubtedly have done a better job.

I believe our study of forecasting, scheduling, and budgeting inventories has been the most significant development of the past year affecting production management. We are a long way from completely solving this problem, but we are better equipped to take care of the next boom or depression—*General works manager of an electrical manufacturing plant.*

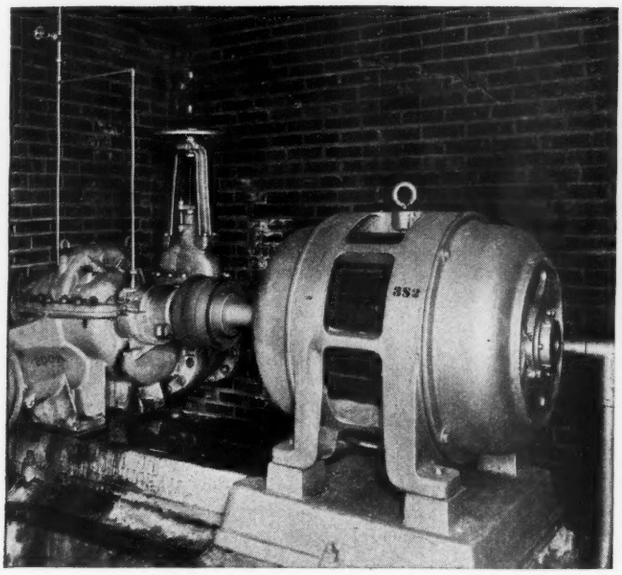
13. Plant Burden

Last year we separated our plant burden into fixed and variable items. For some time past we had used a percentage of our total plant burden expense for the variable item, and experience so far has proved to us that this percentage figure was reasonably accurate.

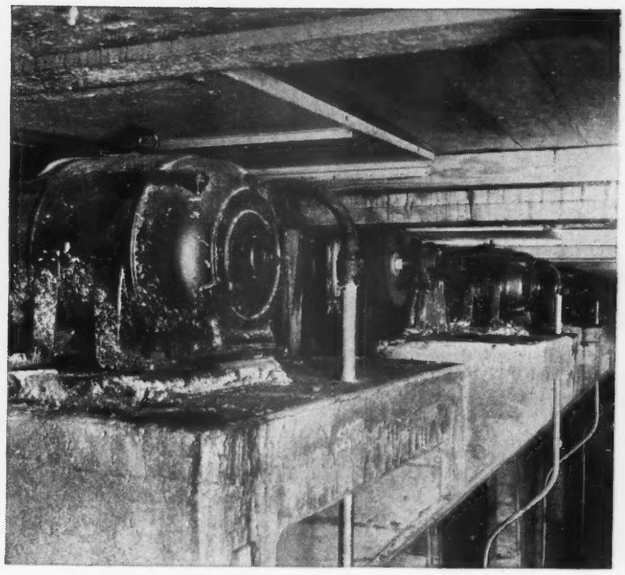
Experience during the past year has also definitely proved that since we made the split we have a much better control over those items of burden that go hand in hand with direct labor. That is, we have been able to reduce many items by being able to prove to our plant executives that some of them should fluctuate in direct proportion to the amount of business going through the plant—*Vice-president of a plant making wooden shipping containers.*

14. More Output per Man

We made a careful study of every process or operation. Result: The combination of many heretofore individually operated machines and the addition of controls and mechanical



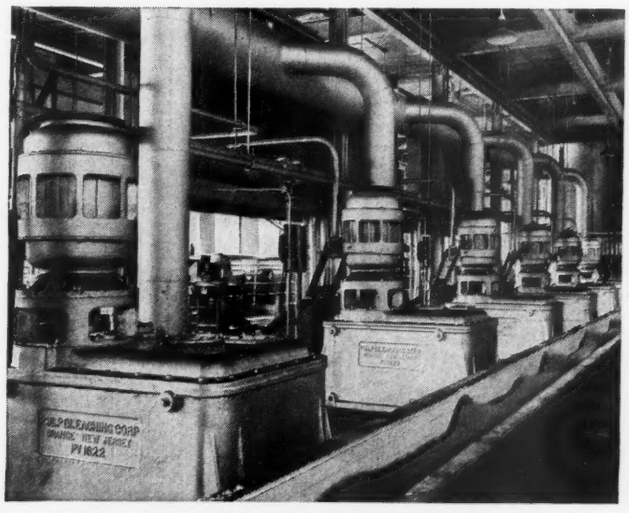
100-hp. F-M Type "QS" motor driving blow pit sluicing pump.



A few of the F-M splashproof motors driving flat screens.

350 F-M MOTORS IN ONE PLANT

mean diversified application—an F-M motor for every job



Six of the nineteen F-M vertical motors used on second stage of pulp-bleaching cells.

THE adaptability of Fairbanks-Morse motors to a wide variety of applications and their ability to "take it" are convincingly demonstrated in the Soundview Pulp Mill at Everett, Washington where more than 350 F-M ball-bearing motors, totaling 10,000 horsepower, are doing their part in maintaining dependable and economical operation.

In plants of this character, conditions of high temperature, excessive moisture, dripping water and acid, and high peak loads are constantly encountered. Operation is continuous—hence shutdowns are serious.

The company selected Fairbanks-Morse motors because they knew from previous experience that F-M motors could be depended upon under these severe working conditions.

For details concerning F-M motors and F-M service, write Fairbanks, Morse & Co., Dept. 30, 600 S. Michigan Ave., Chicago, Ill. 36 branches and service stations throughout the United States.

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FAIRBANKS MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT
WATER SYSTEMS
WASHERS-IRONERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

Motors

aids to operators, increasing (and in some cases doubling) output per operator, with physical labor approximately the same—*Superintendent of a company manufacturing electrical fixtures.*

15. Building for Stock

I feel that the study of our entire order system, from receipt of orders at a branch to the shipping of the final product, has done a great deal to promote changes that will make for economies and dispatch. This involved a new method of long-range forecasting with bi-monthly recheck on requirements; a method of segregating stock and special types of products; and the initiation of the principle of building into and shipping from stock, although this last is complicated by the semi-perishable nature of our product—*Works manager of a storage battery company.*

16. Divorced Job Orders

We have found it absolutely necessary to divorce job work from production and semi-production items, and while our study was a difficult one, it has worked out very well in practice. As a matter of fact, our records indicate that plant transportation has been cut approximately 19 per cent while production costs are now showing the results we expected—namely, a saving of 10 per cent the first year and upward to 20 per cent after the program had been in effect for two years or more. The program involved a complete re-layout of our entire factory.

Our next big problem will be the coordination of all production planning. We are highly centralized at the present time, but expect to work out a combination so that our final picture will carry the centralized program up to what we consider the most efficient point, whence we shall decentralize in an attempt to get better control—*Works manager of a plant making wood and steel furniture.*

17. The Right Balance

We have recently worked out a better system of control to maintain the proper balance among sales, production, and inventories. This is a universal problem, but with us it is especially critical. Changes and improvements in our products are of weekly occurrence. We have to manufacture 60 per cent of our material for stock, but we have no outlet except the scrap steel market for superseded layouts. We have to carry hundreds of different types and sizes of rock bits alone. It is easy to see that a few slips a year might make the difference between a profit and a loss—*Works manager of a Texas company manufacturing rotary drilling tools.*

18. Checks Budgets Weekly

We are giving more attention to laying down our sales plans, converting them into operating budgets, and then checking week by week to see that we come through with performance according to plan. All this is a perfectly logical development from what had been done before and is simply carrying it a few steps farther —*Division manager of Eastern textile mills.*

19. Standards and Budgets

The outstanding development of the past year has been the installation of standards in our production departments. The problem that caused the most concern was the one involving the human element. This was not confined only to the workmen but in quite a degree to the foremen. Naturally it was a trying period and one that was full of all kinds of pos-

P&H TRAV-LIFT CRANES

For Loading and Unloading

Trucks in these busy zones can load or unload quickly and easily with P&H Trav-Lifts operated by pendant rope or push-button control. These cranes, designed for intermittent duty, are low in cost—available in any size and capacity up to 15 tons — provide the same movement of loads as continuous duty cranes. P&H Trav-Lift Cranes are described in Bulletin H-13. May we send your copy? Harnischfeger Corporation, 4525 W. National Ave., Milwaukee, Wis.

HARNISCHFEGER CORPORATION

HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

KEEP YOUR PRODUCT FROM GETTING RATTLED

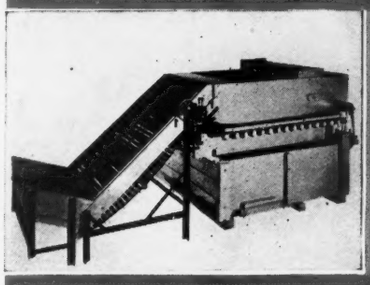
YOU WHO MANUFACTURE PRODUCTS USING SCREWS ARE FORTUNATE TO HAVE IN ONE DEVICE A METHOD OF

1. **saving up to 50% in assembly cost, and**
2. **building longer life into your products.**

The Phillips Recessed Head Screw drives faster and sets up tighter. No danger of driver slipping from the screw's recess, so power drivers are used more often. And the screws — recessed for maximum strength in the head — set up flush without pilot holes, without split heads, without burrs. ¶ There's so much more holding power in a Phillips Recessed Head Screw that you can often use *fewer* or smaller, *lower cost* sizes!

ASSEMBLY COST DOWN . . . SALES VALUE UP

DOUBLE REASONS FOR PHILLIPS SCREWS

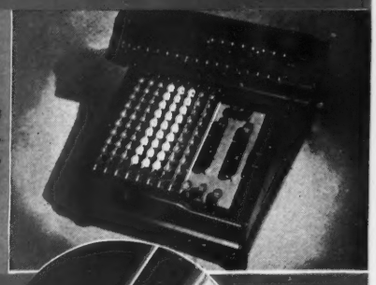


MORE WORK PER HOUR

Manufacturer of fruit and vegetable cleaning equipment finds use of Phillips Screws saves 35% in assembly time.

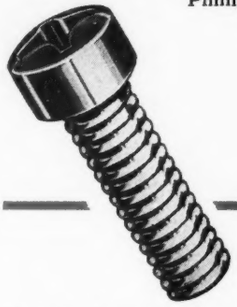
CAN'T LOOSEN

Easier-to-drive Phillips Screws set up flush without heads splitting. Greater resistance to vibration.



PRECISION FIT Stops Fumbling, Crooked Driving, Burrs

The Phillips Recessed Head Screw clings to the driver. The driver centers in the screw's recess, drives straight with one hand free to hold the work. Absence of shearing action means no burrs. Shape, taper and depth of the genuine Phillips recess were determined after months of research. The recess utilizes the driver's maximum turning power without sacrifice of strength in the screw head. Four sizes of Phillips Drivers give best efficiency over entire range of screw sizes. 2 driver sizes fit diameters #5 to #16 inclusive.



PHILLIPS

RECESSED HEAD SCREWS

MACHINE SCREWS · SHEET METAL SCREWS · WOOD SCREWS · STOVE BOLTS

U. S. Pat. on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338

THIS BOOKLET will help your plant to cut assembly costs 50% and more. Address one of the firms below for free copy.

American Screw Co., Licensor, Providence, R. I.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corporation, New Britain, Conn.
The Lamson & Sessions Co., Cleveland, Ohio
National Screw & Mfg. Co., Cleveland, Ohio
Parker-Kalon Corporation, New York, N. Y.
Pheoll Manufacturing Company, Chicago, Illinois
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y
Scovill Manufacturing Co., Waterbury, Conn.

IT COSTS LESS TO USE PHILLIPS SCREWS

The BROWNING CRANE & SHOVEL Co.

ESTABLISHED 1899

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40 YEARS OF LEADERSHIP

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CRAWLER, TRUCK AND WAGON
SHOVELS
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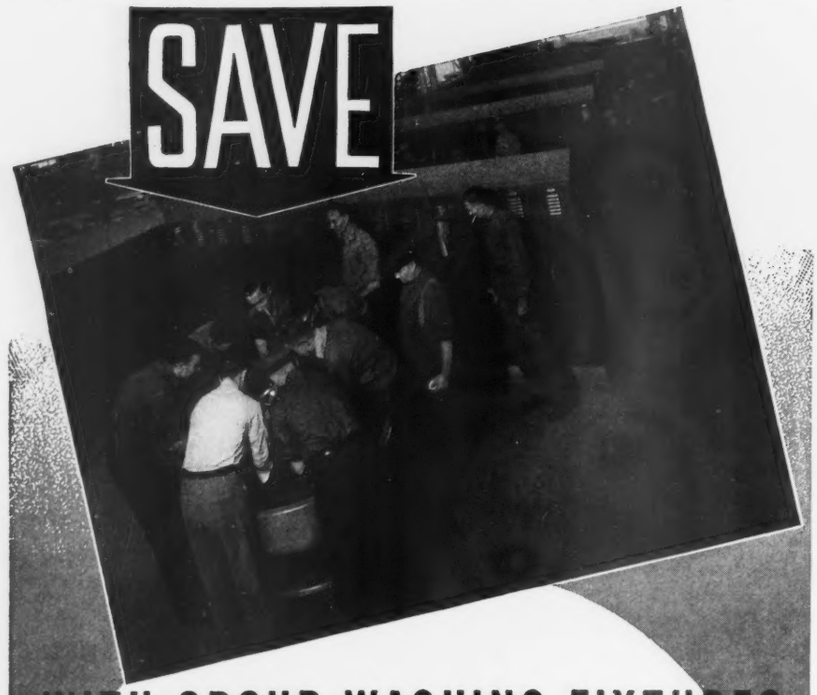
GASOLINE
STEAM
ELECTRIC



WITH GROUP WASHING FIXTURES

Save Workers Time—Promote Cleanliness—Aid in Reducing Dermatoses—Keep Men on the Job —Save Space, Water, and Installation Expense

• As many as 10 men can wash *at one time* in the clean, running water—yet each Bradley requires no more piping connections than one *single* wash basin!—one hot water, one cold water and one drain connection. Installation and maintenance expenses are reduced —70% less water is consumed. . . . Without obligation, experienced washroom consultants can help you—suggest arrangements for new or existing buildings. Bradleys will pay for themselves out of *savings* —as pointed out in our Catalog 937. As a first step, let us mail you a copy. . . . BRADLEY WASHFOUNTAIN CO., 2215 W. Michigan St., Milwaukee, Wis.

BRADLEY WASHFOUNTAINS

Plans and ideas for washrooms will be furnished by Bradley Washroom Consultants. Our free Catalog mailed also on request.

sibilities affecting production. We are happy to say that standards have been accepted by the men, and production is more efficient than it was before.

We have two important jobs ahead of us—planning and scheduling, and departmental budget control. By better planning and scheduling the work on machines, assembly, and erection we feel sure we can bring about better coordination between departments and reduce the amount of work in process. This is an important part of the problem of reducing inventories.

By placing each department on a budget which covers every element of production costs, we hope to gain more effective control over unnecessary waste of productive hours, nonproductive hours, small tools, and supplies—*Superintendent of a company manufacturing printing machinery.*

20. How Cut Unit Costs?

Our greatest problem during the past year has been the increase in production unit costs due to higher wage rates brought about by unionization and collective bargaining agreements.

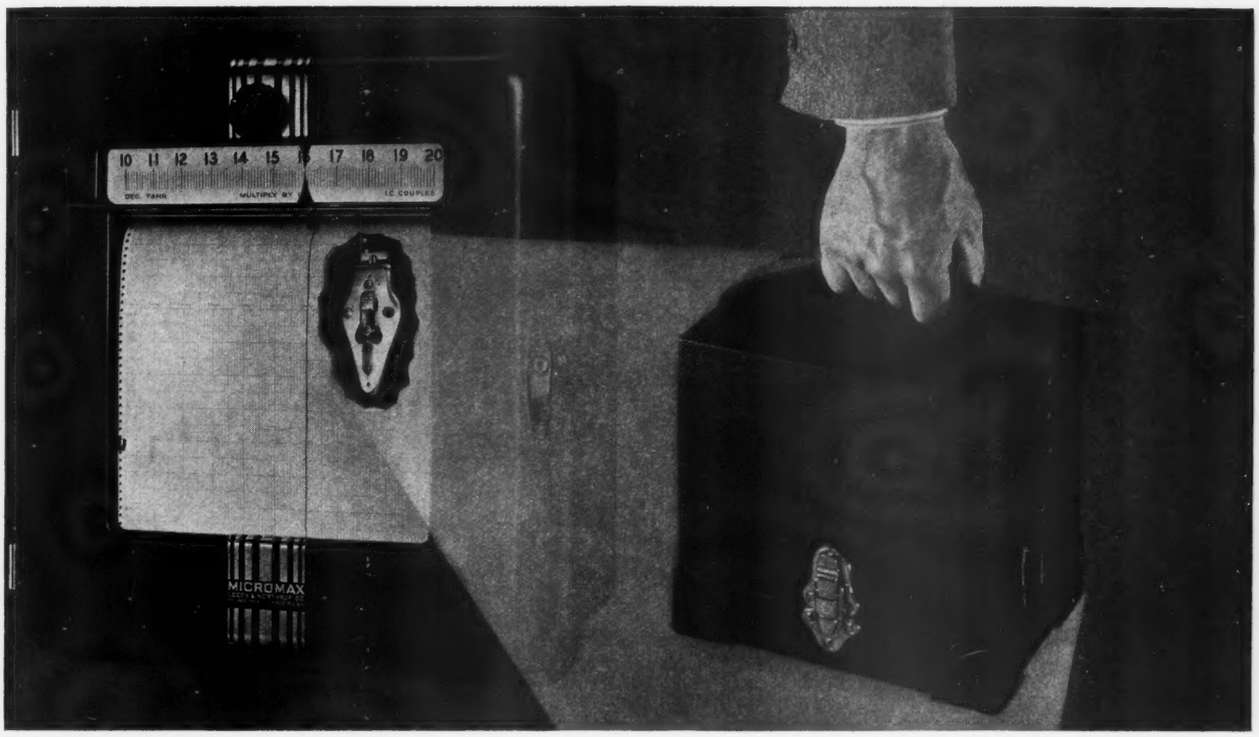
Management seemingly has lost the control over wage rates that formerly made it possible to adjust them in line with general conditions, fluctuating volume of business, prices, and the like. This problem is particularly acute in companies that have fully utilized the advantages of mechanized production and modern production methods under which high production records and low unit costs have become established. In our case, we are studying a method of production that will completely revolutionize the present method—one that may even involve new plant construction and layout, and an entirely different method of handling our order production—*Vice-president of a retailing company with varied manufacturing plants.*

How We Organized A Welding Department

(Continued from page 63)

shown an oxidizing flame. Then he was told that the desired flame was a neutral flame, and this type of flame was demonstrated. Proper use and care of tools was also emphasized under this part of the employee's training.

These instructions were conducted both from a safety standpoint and from a desire to preserve the equip-



See FOR YOURSELF...AT YOUR DESK...

WHAT A MICROMAX PYROMETER CAN DO!

Here's a handy demonstrator in which you can have the much-discussed micro-balancing unit of a Micromax Pyrometer brought right up on your desk—where you can see what it does and decide what it offers . . . even better than by watching the instrument itself.

You can set it to simulate a temperature change of any size—yet even when the change is so tiny that you can't see the galvanometer move, you can still see the motion produced in the balancing mechanism, and you can also see how that motion would be carried to indicating and recording mechanisms and to the controlled valve. If you haven't seen this demonstrator, even though you're now using Micromax instruments, ask the nearest L&N office.

PHONE OR WRITE ONE OF THESE L&N OFFICES

BOSTON: 80 Federal St.
BUFFALO: Del. Ave. & Tupper St.
CHICAGO: 307 N. Michigan Ave.
CINCINNATI: Cent. Pwy. & Walnut
CLEVELAND: 1623 Euclid Ave.
DETROIT: 7430 Second Boulevard
HARTFORD: 75 Pearl St.
HOUSTON: 1314 Texas Ave.
LOS ANGELES: 4320 Loma Vista Ave.
NEW YORK: 60 E. 42nd St.
PHILADELPHIA: 4900 Stenton Ave.
PITTSBURGH: 119 Federal St., N. S.
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LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

5 PRACTICAL STEPS

IN *YOUR* INDUSTRIAL RELATIONS PROGRAM

If you would encourage loyalty and good will among the people who work for you, make your industrial relations *practical . . . personal.* The experience of progressive management suggests five of the little "big things" that make employees want to say—"I'm working for a good company."

1 *Play* is as necessary to well-balanced men as it is to healthy youngsters. Elaborate equipment is not required . . . a bat, a softball. Ping Pong, card tables, bridge clubs thrive with little organization.

2 Companies now issue regular, separate statements to *employees* as well as stockholders. In "primer" style, these help show workers what they are working for and where wages come from.

3 Movable wagons or convenient stands in the plant to supply candy, soft drinks, tobacco, etc., are welcomed during rest periods, and often result in a noticeable step-up in *efficiency.*

4 No one can keep up steady work too long. Correctly timed rest periods offer a change of pace that usually increases productivity as well as satisfaction with working conditions.

5 *Washrooms* with hot water, soap and *individual* ScotTissue Towels remind workers several times a day of a management vitally interested in their welfare . . . health.

The Scott Washroom Advisory Service is available to help arrange washrooms comfortably, economically and efficiently. A Scott Engineer will suggest how to relieve congestion, reduce waste, overhead, and create good will in plant or office washrooms. Please send for our booklet. FM-2

• Scott Paper Company, Chester, Pa. Send me, without obligation, "Scott Washroom Advisory Service."

Name_____

Address_____

Copr., 1939, Scott Paper Co.

ment being used. While instructions on the use of a torch were being given, stress was placed on the fact that, properly handled, it is a safe, efficient, and extremely useful instrument, but that careless use might cause painful, severe, and even dangerous burns. Careful usage as a means of prolonging the life of the instrument was also emphasized.

After full verbal instructions, the employee was shown the specific job he was to do, and allowed to apply the verbal and visual training he had received. After he had done several pieces of work, his practice was stopped and his work subjected to examination and criticism.

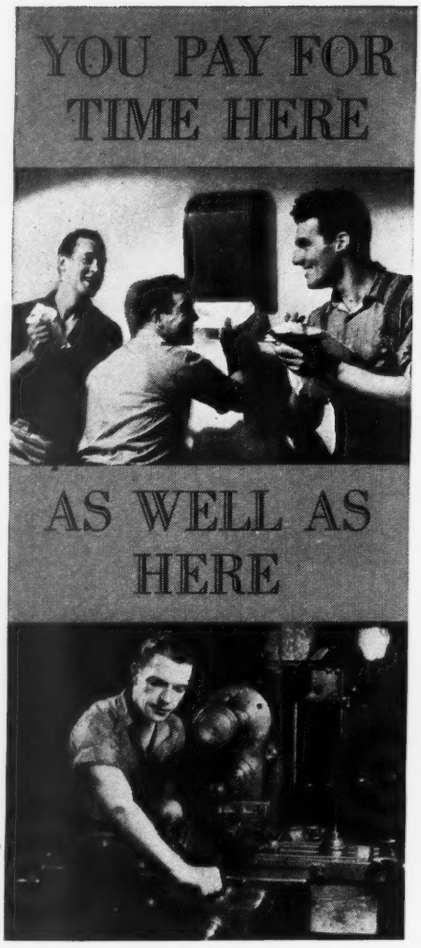
The instructor and the employee analyzed the work with reference to both motion efficiency and work quality. A special effort was made to have the operator discover his own errors, since the incentive for improvement and increased ability is enhanced by the desire to overcome self-recognized faults. The practice was repeated until the instructor believed the employee ready to handle regular production work.

Full operator status was then granted to the employee. However, training never ceases. It is the foreman's duty to analyze, improve, and instruct the employee in advances in methods of operation, and also to attempt to fit those employees who are slow or inefficient on one function into an operation where they may perform with maximum competency.

5. Supervision—The specialized requirements of the personnel in this work led us to consider the supervision needed. Needless to say, the supervisor of this work is a specialist with a thorough and practical knowledge of the various procedures involved. He is also tactful and fair, is a good leader, and possesses the ability to train that is so necessary in any successful supervisor. Under such supervision the department should have efficient and successful production.

6. Inspection—With all provisions made to get the work under way, the next consideration was inspection. Because of the technical characteristics in both the occupation and the product, a trained inspector was needed to determine whether or not the product and quality were acceptable.

7. Maintenance—With the inspector selected, the maintenance problem confronted us. We had to provide for maintenance so that equipment would be kept in the finest possible working condition, and improvements made where and when practical. The



DO YOU know more time is wasted in the washroom than in any other part of the plant or office? This is usually due to arrangement of equipment as well as lack of efficient towel dispensers. Faulty arrangement of tissue and towel holders, too, results in excessively high washroom *costs.*

Scott Paper Company now offers you a *check list* of efficiency and cost-reducing facts that can put washroom service on a satisfactory and economical basis.

FREE!

"Washroom Advisory Service" Booklet shows you how to relieve congestion... reduce overhead in washrooms.

Scott Paper Company, Chester, Pa. Please send me *without obligation* "Washroom Advisory Service." FM-2

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MEMO TO EXECUTIVES

Just dictating a short letter like this has brought greater efficiency and increased profits for many companies in a wide variety of industries.

GAYLORD CONTAINER CORPORATION
ST. LOUIS, MISSOURI

GENTLEMEN:

YOUR ADVERTISING OFTEN MENTIONS THAT GAYLORD CORRUGATED OR SOLID FIBRE SHIPPING BOXES HAVE HELPED MANUFACTURERS SIMPLIFY PACKING, REDUCE DAMAGE CLAIMS AND INCREASE SALES.

WE WOULD LIKE TO HAVE YOU CHECK OUR PRESENT PACKAGING SET-UP TO DETERMINE IF SUCH BENEFITS COULD BE SECURED FOR US.

WILL YOU HAVE YOUR REPRESENTATIVE SEE OUR MR._____ AND WORK WITH HIM? WE UNDERSTAND THIS WILL NOT OBLIGATE US, UNLESS YOU DISCOVER A DEFINITE WAY TO BETTER OUR PACKAGING OPERATION.

VERY TRULY YOURS

_____

Gaylord Boxes

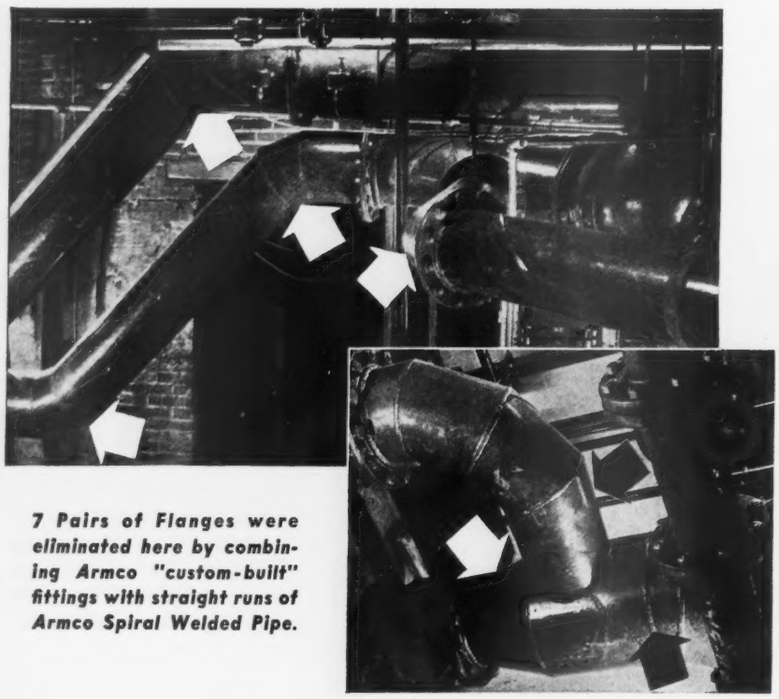
CORRUGATED AND SOLID FIBRE

Also GAYLORD FOLDING CARTONS • GROCERY BAGS and SACKS • KRAFT and SPECIALTIES

GAYLORD CONTAINER CORPORATION, General Offices: SAINT LOUIS

There's a Gaylord plant or sales office in your territory

Look What You Save with ARMCO PIPE



7 Pairs of Flanges were eliminated here by combining Armco "custom-built" fittings with straight runs of Armco Spiral Welded Pipe.

• Study these pictures for a moment. Then check your own piping layouts to see how many flanges you can eliminate by redesigning with Armco "Spiral Welded." • Chances are, you can reduce costs up to 25 per cent because Armco Pipe and fittings are shop-fabricated to your exact measurements. This eliminates a pair of flanges at each bend, reduces unnecessary weight, and saves hours of tedious assembly. Fewer gaskets also mean fewer potential scources of leakage. And remember, you gain extra space in your mill because Armco Piping requires less clearance than heavy, bulky types. • Whatever your needs, you'll find Armco "Spiral Welded" amply strong; smooth inside for peak flow capacity. Besides, it assures long thrifty service because there are no threads to weaken the metal and invite corrosion. Diameters run from 6 to 36 inches; wall thicknesses from 7/64 to 1/2-inch, with a choice of base metals and optional coatings. Just mail your specifications to The American Rolling Mill Company, Pipe Sales Division, 450 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO

SPIRAL WELDED PIPE

supervisor was given to understand that his watchfulness and interest determined the maintenance standard of the department and that he should be guided by the old adage "A stitch in time saves nine."

After All—Employees Are Just People

(Continued from page 57)

include at least the following provisions:

1. A method for insuring sincere collective negotiation and continuous cooperation with employees, through representatives of their own choosing, on all matters in which they have a proper personal interest, such as wages and hours, working conditions, methods and standards of work, job rating, and advancements.

2. A method for prompt and continuous discovery of grievances and dissatisfactions, and for their fair and impartial settlement. The employee should have the right of appeal to the highest authority if he feels that he has not been treated fairly. A satisfactory method for the settlement of grievances will have to include some procedure for insuring a decision by an authority that is important or which represents both workers and management.

3. A wage standard at least level with the pay for similar work in the locality; with equitable differentials that take into account skill, experience, reliability, responsibility, physical demands, and hazards.

4. A wage incentive system offering an equitable reward to individuals, or groups, for accomplishment above a standard that is based upon scientific measurement and equitable requirements, and which has the approval of the most of the employees.

5. A standard of working hours, overtime, holidays, and vacations with pay that is as favorable to the employees as that found in other similar businesses or in the community, and which is consistent with the health, welfare, and contentment of the employees.

6. Equitable rules and standards for promotion or transfers, lay-offs, and re-employment, which give due consideration to length and quality of service and to competency, and effective methods for insuring employees against any inequitable application of such rules or standards, through the right of appeal or review.

7. The establishment of effective methods of selecting employees for jobs, of training them for efficient work and promotion. The training of supervisory employees should include education in understanding company policies and for effective leadership and the training of subordinates.

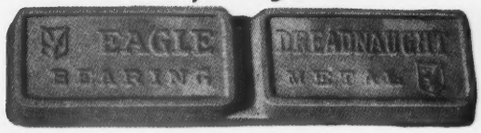
8. Provisions for safe working condi-

3 are easier than 10!

THESE 3 Eagle BEARING METALS meet most bearing metal requirements!

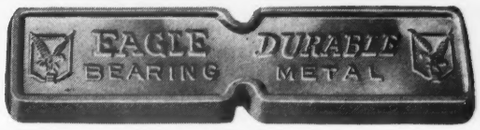
Eagle Bearing Metals are made to

Controlled Specifications



EAGLE DREADNAUGHT
For extreme speed and pressure conditions.

EAGLE OUTLASTA
For medium speed and pressure conditions.



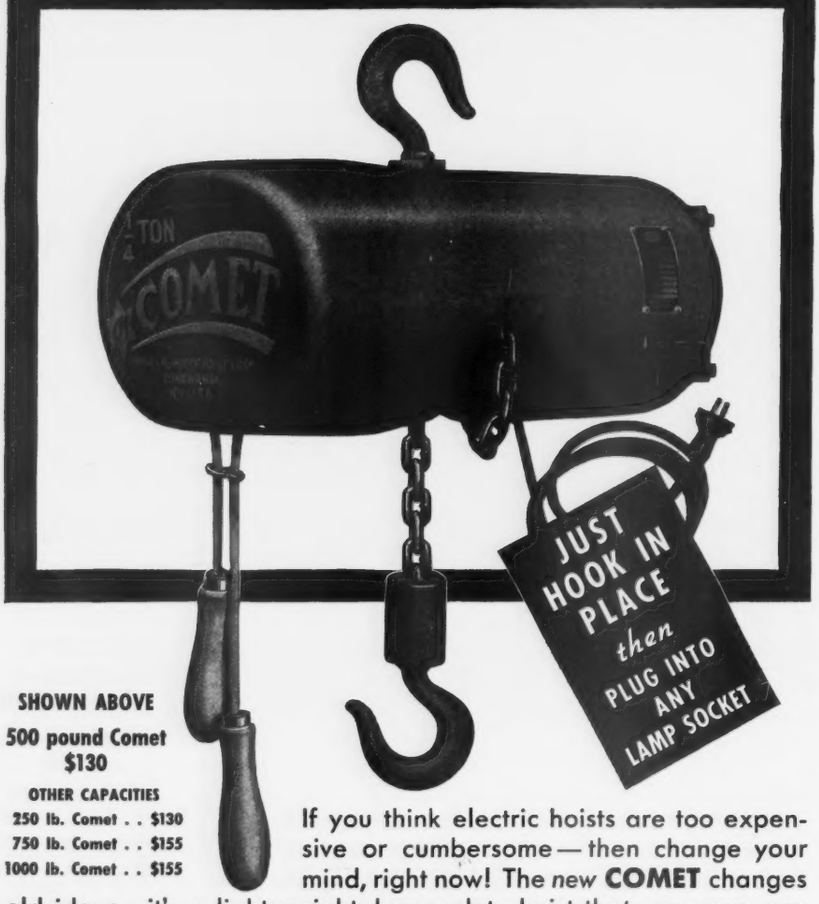
EAGLE DURABLE
For low speed and pressure conditions.

EAGLE'S
Controlled Specifications

protect your equipment . . . Guard against bearing metal trouble . . . costly shutdowns . . . by specifying Eagle. The three Eagle Bearing Metals are made of only clean primary metals, scientifically alloyed under strict pyrometric control to assure uniformity and long life. Eagle Bearing Metals contain no hard spots to cut and score the shaft. Their use is an added guarantee of trouble-free operation.

EAGLE EP PICHER **THE EAGLE-PICHER LEAD COMPANY** • *CINCINNATI, OHIO*

All set FOR VERSATILE HOISTING in a Jiffy!



SHOWN ABOVE
500 pound Comet
$130

OTHER CAPACITIES
250 lb. Comet . . $130
750 lb. Comet . . $155
1000 lb. Comet . . $155

If you think electric hoists are too expensive or cumbersome—then change your mind, right now! The *new* **COMET** changes old ideas—it's a light weight, heavy-duty hoist that your men can shoot about the plant to handle those numberless lifting jobs that take costly time and tire workers out . . . Here's new speed, new portability, new handling versatility—all at a new low price level. From receiving to shipping department, the *new* **COMET** is a dependable short-cut to stepped-up efficiency. Literature on request.

CHISHOLM-MOORE HOIST CORP.
(Division of Columbus-McKinnon Chain Corp.)
130 FREMONT AVENUE TONAWANDA, N. Y.

CM COMET

tions, and full protection of employees against fatigue, injury, and disease.

9. Provisions, in so far as the condition of the business makes them possible, against the risks of unemployment, disability, old age, and death.

None of these steps should be taken without careful consideration by all executives who will be concerned with their establishment and operation, or before they have been discussed with, and approved by the representatives of employees. After they have been decided upon they should be published in understandable form, and, where necessary, fully explained to all employees.

Changes in policy and methods should not be made until after they have been discussed with and approved by employees' representatives.

To make a labor relations policy, such as I am suggesting, fully effective will require careful and patient education of all who have any part in carrying it out.

Is this a starry-eyed dream? Is it an impossibility under the stress and strain of today's labor situation? I believe it is neither one nor the other. In fact, it has been demonstrated in a large number of cases that it is a practical program, highly satisfactory to everyone concerned.

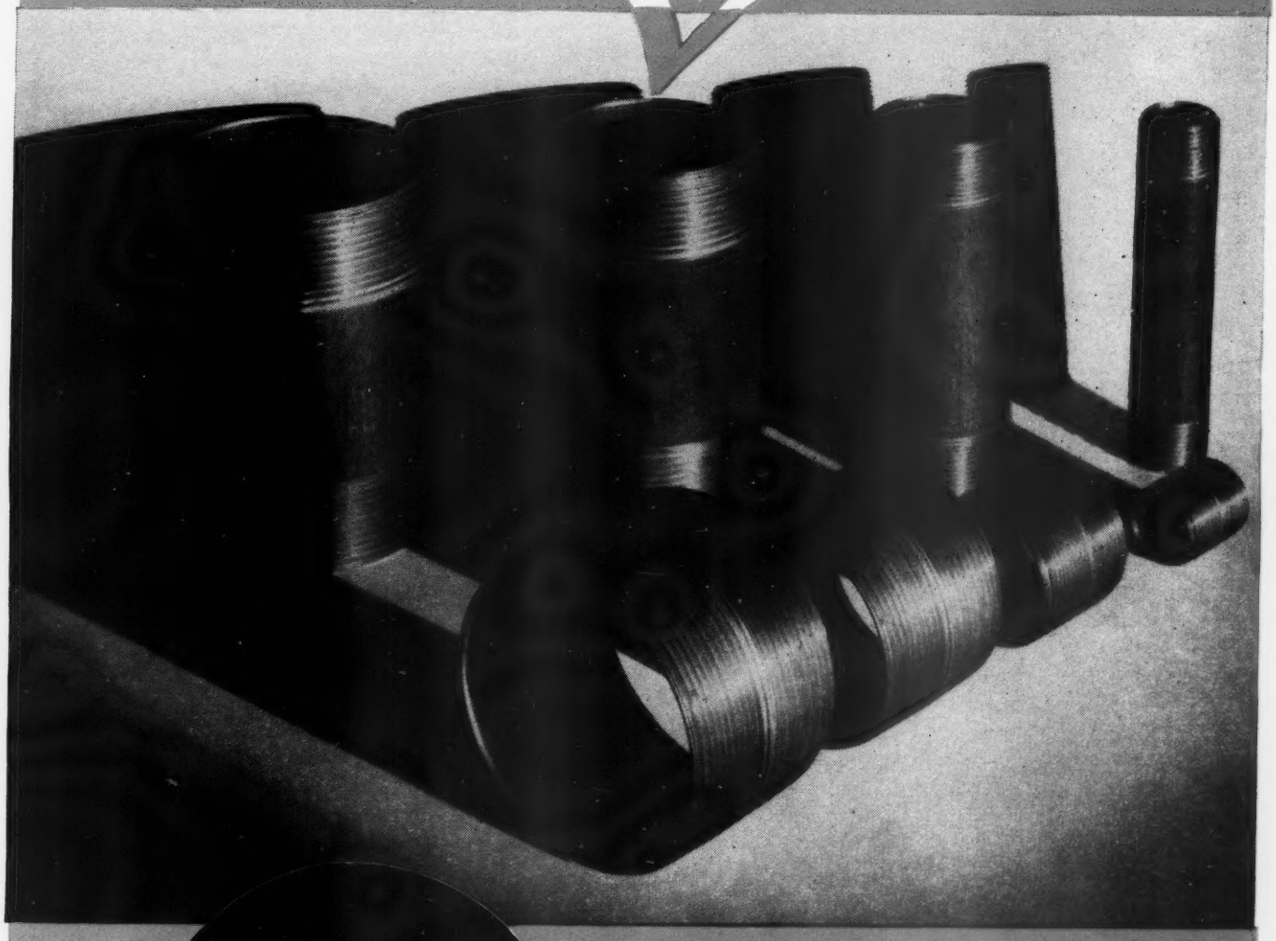
The suggested program inherently involves a recognition of the right of employees to collective bargaining through representatives of their own choosing. It implies that such representation may be through labor unions. It suggests not only self-education, but education of employees' representatives. Some may say that under the Wagner Act management should avoid any attempt at education of that kind, but we may be sure that such education is entirely proper if it does not involve any denial of rights guaranteed by the Act.

A word of caution: Careful preparation for the program is necessary. Patience and forbearance are essential. Old habits of thought and old prejudices cannot be changed by words or by a short experience of a new relationship. Words without acts will make unfavorable impressions. Sincerity of purpose on the employer's part is absolutely necessary. Subterfuge, or lack of honesty and frankness, will be fatal. A patronizing or a domineering attitude will make it impossible to secure employee confidence and respect.

The relationship, if it is to be mutually satisfactory, must be on a straightforward basis of equality and democracy, without any class consciousness or sense of superiority or conflict of interests.

Another caution is necessary. A

MADE FROM 1st GRADE PIPE



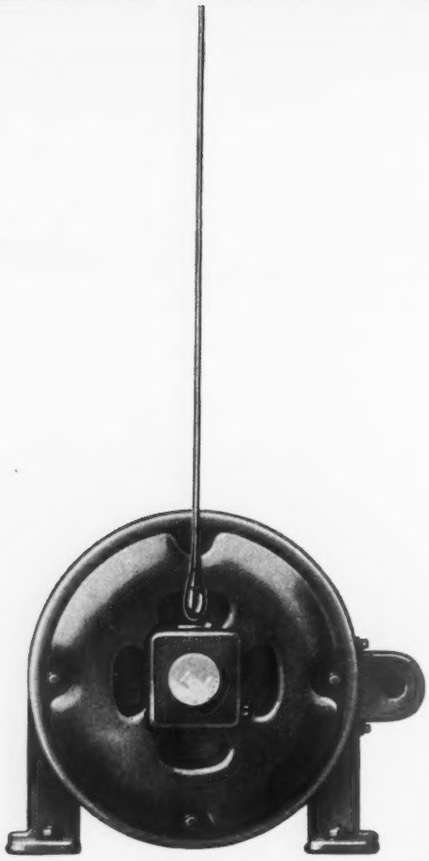
✓ Only first quality, new pipe is used in making Grinnell Nipples . . . ✓ Finest cutting and threading equipment produces clean, sharp threads, every one to gauge . . . ✓ Correctly chamfered ends for quick starting . . . ✓ Grinnell Nipples are thoroughly cleaned, individually inspected. ✓ Made of Steel, Iron or Brass.

Specify Grinnell Nipples for premium quality at no extra cost. Use Catalog 4 as your guide. Grinnell Co., Inc. Executive Offices, Providence, R. I. Branch offices in principal cities of the United States and Canada.

GRINNELL

WHENEVER PIPING IS INVOLVED

LESS OIL... LESS OFTEN



FOR MOTORS

"... as soon as we changed to STA-PUT, our oiling labor was cut 73% ... and the previous oil used was *also* one of the best known in the country. That was a year ago, and though those motors are in a hot and difficult location they run cooler and consume less power. Needless to say, the saving has been considerable ... !" So wrote the electrical engineer of an American super-plant. Others, in all industries, are getting the same results by using these specially treated STA-PUT lubricants ... not only on motors, but throughout their plants —on machine tools, line shafting, gears, and many other applications. These leak-resistant lubricants are available in all viscosities ... and fewer grades are necessary. The booklet gives the whole story. Write for it, or call the Houghton Man!

E. F. HOUGHTON & CO.
Chicago PHILADELPHIA Detroit

STA-PUT LUBRICANTS

program such as I have tried to outline may result in a loss of necessary managerial control, unless it has been made clear to employees that management has certain responsibilities that cannot be surrendered and must not be interfered with by unnecessary restrictions and intrusions. If employees have had the right kind of education, and if their confidence in the wisdom and fairness of the executive heads of the business has been secured, as it must be, there need not be any misunderstanding by employees concerning the line that divides their rights and responsibilities from those of management.

Our problem is to develop attitudes on both sides that recognize the need for continuous work and joint effort toward efficiency and low-cost production, that respect individual rights, that encourage individual responsibility and realize that neither government nor labor unions alone or jointly can insure prosperity.

Management alone cannot bring it about. There must ultimately be a recognition both by management and by labor that only through the cooperation of both, with such governmental restrictions as will prevent abuse or power by either, can we further the welfare of both and prevent an ultimate governmental control which must be fascistic in its nature and destructive of personal liberties and a satisfactory living standard.

The supreme responsibility of management is to demonstrate to the wage earners of the country that such cooperation is to their interest and is essential to their permanent welfare. Knowing that this is true, shall we stupidly sacrifice ourselves and those who are equally dependent upon sound business conditions, by disregarding the handwriting on the wall or by failing to make the effort to find the way toward satisfactory cooperation?

It is encouraging to know that many intelligent leaders of organized labor can and do understand the writing on the wall. They realize the necessity for cooperation between management and labor and the representatives of labor, and see the danger to organized labor, and to all workers, of governmental controls, which tend to make such cooperation difficult, and which, in the end, must inevitably lead, as in other countries, to bureaucratic control of labor as well as of management.

It would seem to be unnecessary to suggest to management that it should welcome every sincere overture toward finding a common ground of mutual interest and mutual respect. And

(Continued on page 114)

STEAM TRAPS HAVE INDIVIDUALITY *too!*

The quickest way to save steam and improve production conditions is to be sure that the right steam trap is in the right spot, on every job.

Look at the five kinds of traps at the right — all different in appearance and size. And each one is designed for a specific function which none of the others can perform as well.

Some are highly sensitive and efficient like "retrievers", some are "bulldogs" used for handling heavy volumes of condensate rapidly, while others function like "police dogs" and provide a practical, low cost temperature control.

And any steam trap can have "distemper" and be bothersome if its mechanical construction and quality of workmanship are not equal to the task at hand.

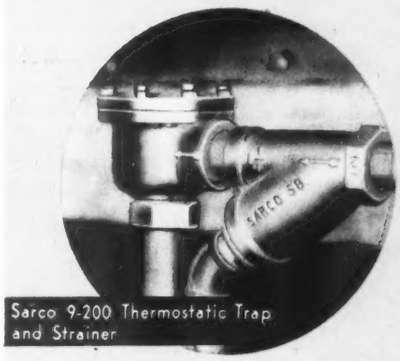
That's why the Sarco Thermostatic element, made of heavy wall bronze tubing, is so important. It is the primary or secondary actuating element on every Sarco Trap made. It has enabled Sarco Traps to succeed where others failed and it has seen service in all types of industries for a quarter of a century.

• • •

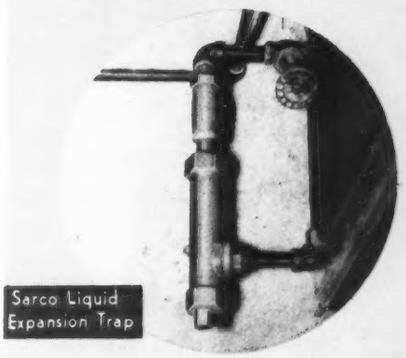
Find out the places *where* a Sarco will speed production or save steam. Find out *what* it will save and how little it will cost. No obligation. Our engineers are at your service—now.

Sarco No. 9 Thermostatic Trap

Sarco Inverted Bucket Trap



Sarco 9-200 Thermostatic Trap and Strainer

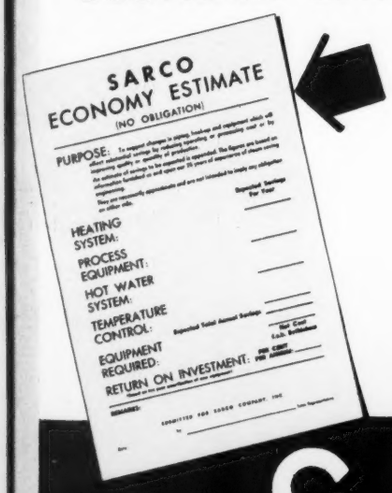


Sarco Liquid Expansion Trap

Sarco Float-Thermostatic Trap

Get the "distemper" out of your steam lines now!

GET A SARCO ECONOMY ESTIMATE



SARCO
ECONOMY ESTIMATE
(NO OBLIGATION)

PURPOSE:

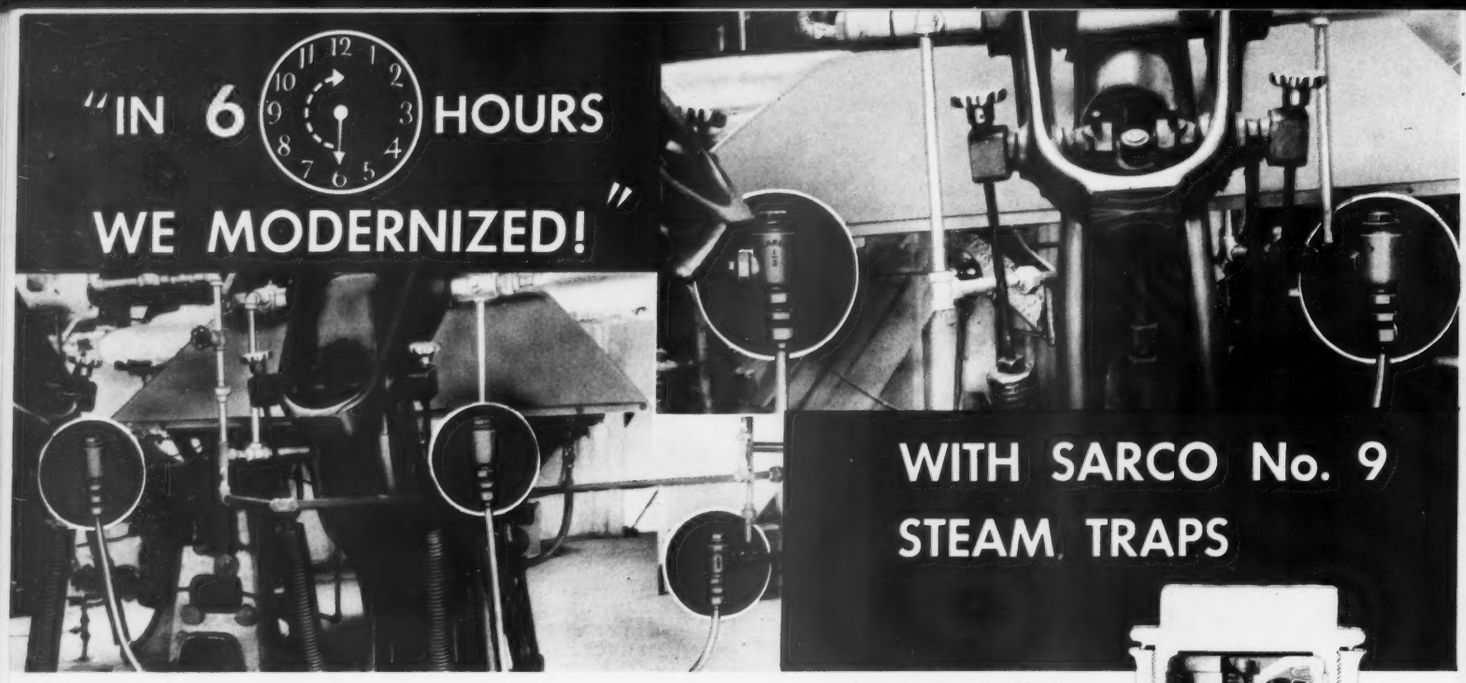
HEATING SYSTEM:
PROCESS EQUIPMENT:
HOT WATER SYSTEM:
TEMPERATURE CONTROL:
EQUIPMENT REQUIRED:
RETURN ON INVESTMENT:

REMARKS:

SARCO

COMPLETE SYSTEMS FOR HEATING AND INDUSTRY

"IN 6 HOURS WE MODERNIZED!"



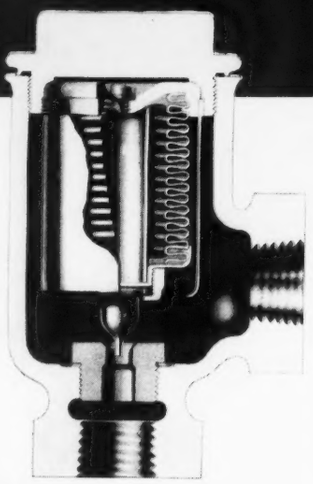
WITH SARCO No. 9 STEAM TRAPS

"Several months ago we decided to install Sarco Steam Traps throughout our plant in order to overcome the sluggish return system we were previously using, and thereby increase our production. In six hours one evening we installed eighteen No. 9's on our presses and miscellaneous equipment and two Float-Thermostatic Traps on our large flat-work ironer.

"Operation of our equipment has been decidedly more satisfactory from the first day the Sarco Traps were installed. The temperature of the equipment has been increased and we do not find it necessary to blow down water clogged equipment in the mornings.

"The improved operation of the machines alone has been more than worth the small investment involved, without considering the apparent fuel savings."

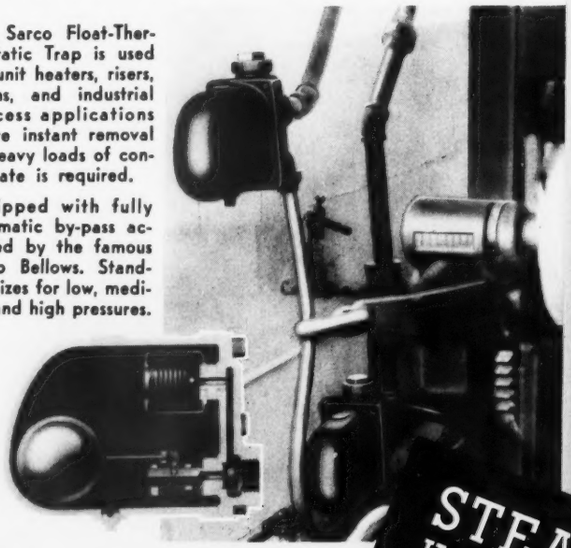
CAROLINE LAUNDRY, Inc., Morristown, N. J.



Actuated by a flexible thermostatic bellows made from helically corrugated tubing. Operates satisfactorily at all pressures from 0 to maximum, without adjustment. Small, easy to install, inexpensive.

Sizes range from ½" to 2". Pressures from 0-200 lbs.

and SARCO FT'S



The Sarco Float-Thermostatic Trap is used for unit heaters, risers, mains, and industrial process applications where instant removal of heavy loads of condensate is required.

Equipped with fully automatic by-pass actuated by the famous Sarco Bellows. Standard sizes for low, medium and high pressures.

In FOOD, PROCESS, CHEMICAL . . .

and other similar industries these same Sarco Traps are speeding up and improving production at lower costs.

One reason why Sarco Steam Traps work satisfactorily where others fail is the famous Sarco Thermostatic Bellows (see illustration). Another is the fact that Sarco Traps are backed by a quarter-century of experience and that they are precision-built in a plant designed for this exclusive purpose.

• • •

The Sarco Steam Hook-Up Book will help you decide which kinds of traps are best for your plant and how to connect them to all types of equipment. Our Representatives will provide a Sarco Economy Estimate without obligation.

ASK FOR THIS DATA BOOK

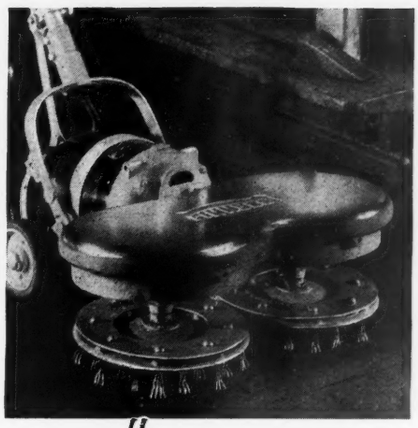
STEAM HOOK-UP

19-A

SARCO

THERMOSTATIC, FLOAT AND BUCKET TRAPS, REGULATORS AND HEATING SPECIALTIES

No Missing Links
in the Finnell Chain of Service



A COMPLETE SYSTEM OF MAINTENANCE
FOR EVERY TYPE FLOOR

Equipment • Accessories • Supplies

Finnell serves every phase of floor care for every type of floor—a unique service that facilitates efficient, low-cost maintenance of clean, sanitary floors.

Finnell offers 40 sizes and types of equipment—a variety adapted to the smallest or largest job of scrubbing or polishing; a complete line of accessories including mop trucks, vacuum moppers, water absorbers, mops, applicators for Gloss Seal, dispensers for Finnell Kote; a complete line of supplies including waxes, sealers, and cleansers.

See what a Finnell System will save *you.* A Finnell floor survey involves no obligation and gives facts upon which you may act with assurance.

Phone nearest branch, or write Finnell System, Inc., 2502 East Street, Elkhart, Indiana

FINNELL SYSTEM INC.

Pioneers in FLOOR MAINTENANCE EQUIPMENT

Everything You Need
FOR LOW-COST FLOOR CARE

Nation-Wide Staff of Finnell Engineers
READY TO SERVE

EYE PROTECTORS That "FIT THE JOB"

No. 399 LIGHT and Adjustable

Special devices for every Industrial Job are practical features of

SELLSTROM EXCEL QUALITY EYE PROTECTORS

Eye injuries of Industry average one in twenty of all accidents; but cost *twice* as much in compensation. Sellstrom devices give greater comfort to wearers; are more willingly worn. Find out how good they are—and how economical to buy.

No. 311 WIDE VISION

Write for Catalog

It shows Sellstrom Goggles, Helmets, Spectacles, Lenses, Sun Glasses and Respirators.

SELLSTROM MFG. COMPANY
643 N. Aberdeen St. Chicago

THIEF! "WASHROOM INFECTION" steals Time, Money, Health

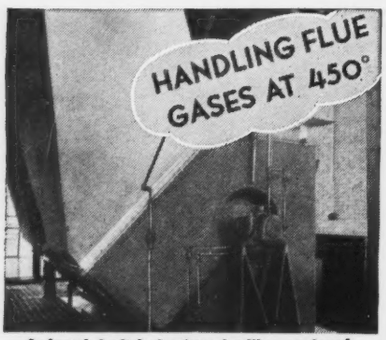
Onliwon gives Effective, Economical Protection

Hard-headed business men know that good health means profitable business . . . sickness means *loss!* Protect employes and you insure your profits. For details of the Onliwon service, call your local A.P.W. distributor, or write to A.P.W. Paper Co., Albany, N. Y.

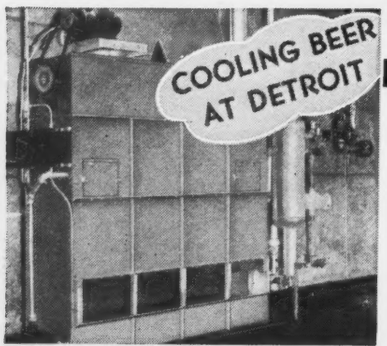
A.P.W.

Onliwon Towels and Tissue

The complete washroom service



Induced draft in boxboard mill . . . a tough job. Fan handles exhaust gases at 450°F., operating continuously day and night.



Shown above is one of thirteen Clarage Unit Coolers installed in new Detroit brewery. These efficient units are adaptable for practically any product cooling application.

NO PROBLEM TOO HARD TO "CRACK"

Clarage builds fans, blowers, air washers, unit heaters, coolers and conditioning units for every conceivable application.

FOR OVER 25 YEARS we have maintained leadership in this ONE field. If you have any "air problem" — no matter how special or unusual—Clarage engineers can offer a satisfactory solution. May we have your next inquiry?

COMPLETE AIR CONDITIONING • VENTILATION • HEATING • COOLING • MECHANICAL DRAFT • FANS & BLOWERS FOR INDUSTRIAL NEEDS

CLARAGE FAN COMPANY • Kalamazoo, Mich.
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

(Continued from page 110)

yet there are many employers who, through prejudice or lack of faith in the success of such an effort, may miss the one road that can lead to a satisfactory business relationship and to a prosperous and happy America.

More for the Company, More for the Girls

(Continued from page 55)

ceptacle for threads. And we knew we wanted to arrange the work within the normal working area. One hand, you remember, was always holding, so the table had to have a holding fixture.

That led to some amusing experiments. The first attempt at a holding fixture resulted in two adjustable "coconuts," as we called them. I'm sure I don't need to go into any long explanation about that one. Rather let me draw your attention to the photograph showing the new method and the workplace as we finally worked them out.

Are you looking? Because if you are I know you will realize at once the advantage of the new way.

First the girl is sitting in a scientifically designed posture chair. There's an adjustable footrest to take care of differences in height. There are sponge rubber arm rests to make the working position even more comfortable.

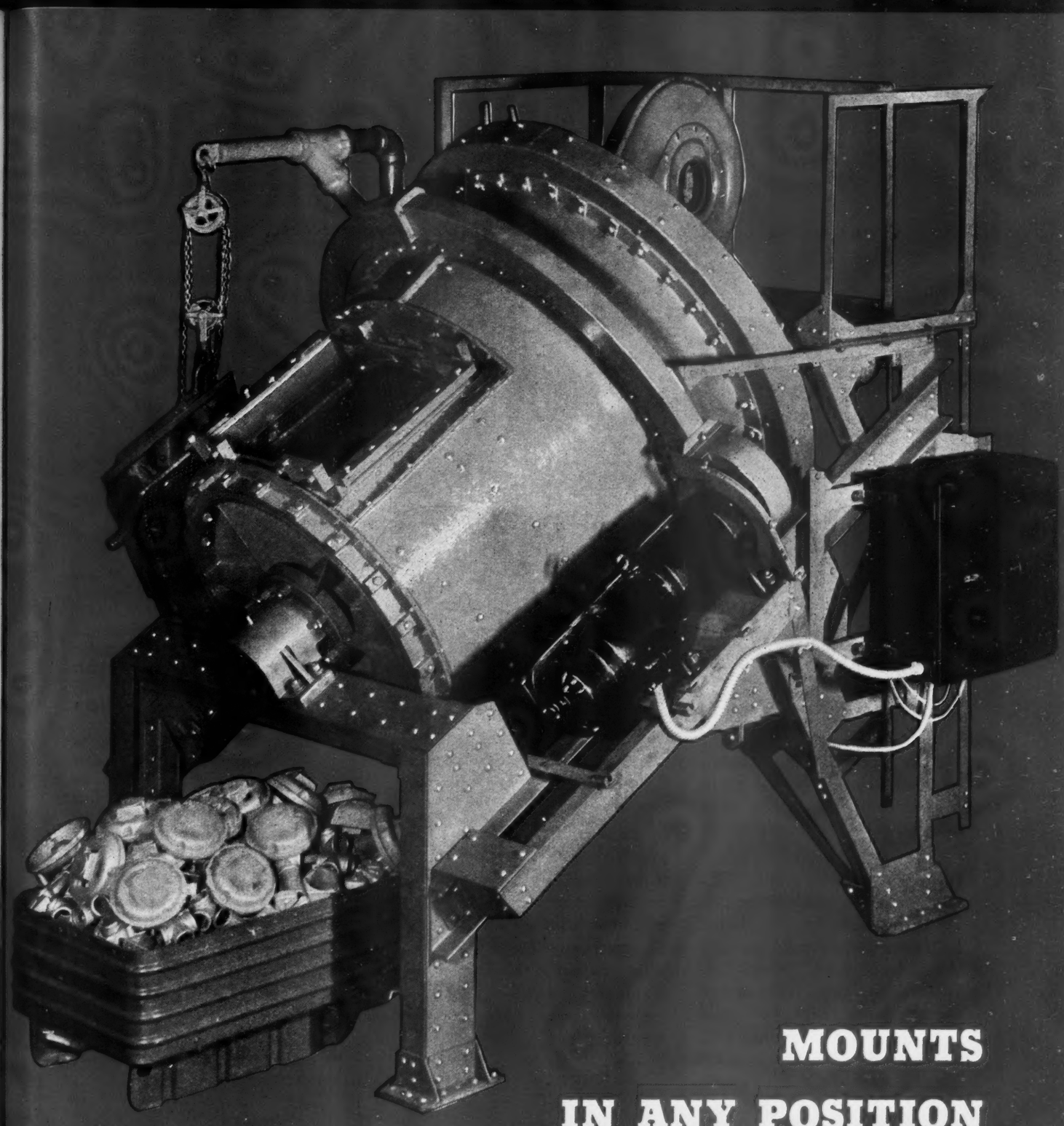
The workplace is, of course, semicircular in shape. The simple holding fixture now in use is a long way from our original coconuts. It is nothing more than two pieces of spring steel to hold the garment in place. Now the left hand never holds. It positions—a useful job.

In the center, right under the girl's hands, is a chute. The waste ends drop into the chute and go down into a collection box.

Also, note the pre-positioned tape (marked by the arrow). When the girl finishes clipping a brassiere, she lays it across the tape and builds up a pile of finished work. When the lot is completed, it's a moment's work to tie it into a bundle.

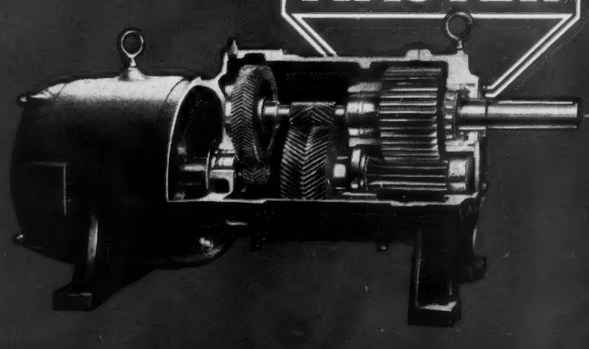
The table has hoppers for pins, tickets, etc. There is a ruler in position so she can check the size of a brassiere should there be any doubt in her mind.

All this was worked out in the lab, you might say, with the one girl we were using for our experiments. When we had what we wanted, we trained her thoroughly in the new method. Then we brought down two other girls and spent two weeks training



MOUNTS IN ANY POSITION

MASTER



Master Gearhead Motors with ball and roller bearings, and positive lubrication seals, operate in any position. This is one more reason why . . . more gearhead motors in use today bear the MASTER name, than all other makes...COMBINED.

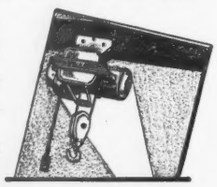
THE MASTER ELECTRIC COMPANY
DAYTON, OHIO

Introduced by Yale just a short time ago, the Cable King with its AIR-COOLING feature is already skyrocketing its way to leadership in the electric hoist field. NOW everybody wants AIR-COOLING!

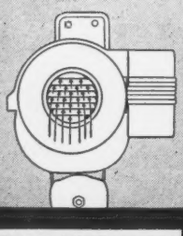
The reason is simple. AIR-COOLING saves the operator money. The basic limiting factor in electric hoist construction has always been excess brake heat. When Yale engineers adapted the special sirocco blower action that would cool the brake frictional parts they, *for the first time,* made it possible to eliminate this heat.

That's the principle of AIR-COOLING—a principle that permits *the Cable King to operate on a heavier duty cycle than any other hoist in the same class.* And that means *greater economy than any other hoist in the same class!*

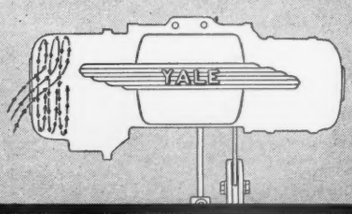
In addition, the precision construction of the Cable King makes it the closest approach to perfect engineering specifications that has ever been built. AIR-COOLING plus mechanical perfection—that's what you get in the Cable King. It's the very latest advance in hoisting equipment. Contact your local distributor or send direct for free catalogue.



STARTLING AND EXCLUSIVE AIR-COOLING PRINCIPLE . . .



The Greatest Economy Factor Ever Developed in Electric Hoist Construction.



YALE

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

them, the first girl acting as instructor and supervisor. Meanwhile we built tables for the two girls being trained. They went back upstairs and two or three more were brought down.

This went on for about 10 weeks. It took that long to make the conversion. No attempt was made to do it overnight.

The new process chart, which shows the way to clip that developed out of all this, is not illustrated. Let me say, however, that it is almost exactly half as long as the old one. The left hand performs 24 operations and 10 transportations, while the right hand performs 23 operations and 15 transportations.

Observe that no longer does one hand, the right, do twice as much as the left. Note that the operation is now a balanced one, each hand doing its fair share. Holding is out of the picture so far as the hands go. It's a job for the fixture.

There is one more thing to do. Let's look at the summary, because it gives a quick picture of the final results. Observe the savings—15 operations and 9 transportations for the left hand, 32 and 18 for the right.

More Production, More Dollars

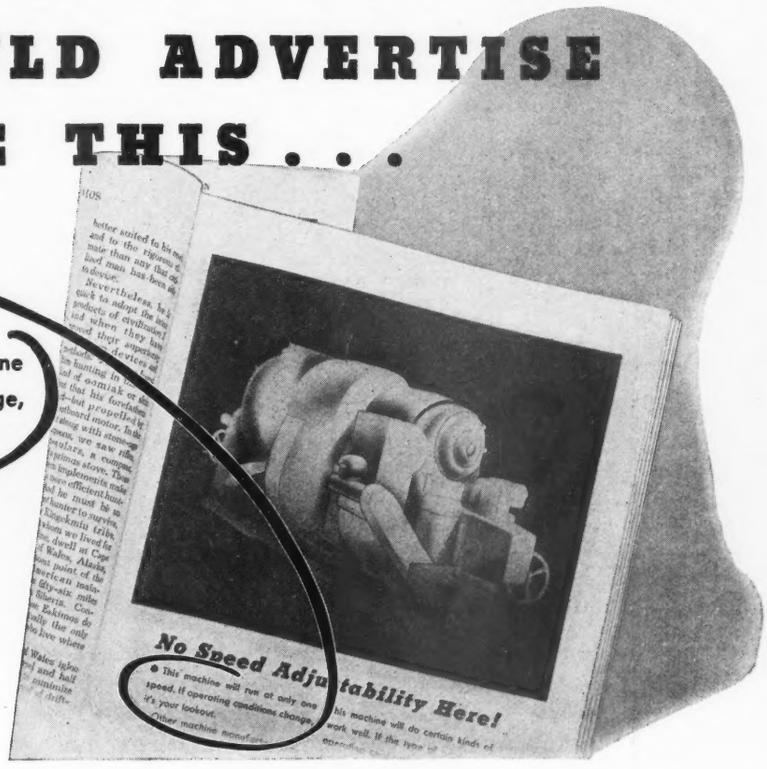
That's the answer—less work to clip one brassiere, so more brassieres clipped without any more effort. As I said at the outset, more production for the company, more dollars for the girls. Their present guaranteed base rate enables them to earn the going wage in the industry. On the average they earn a 25 per cent bonus for standard production. It's a fair sample of what work simplification can do for you and for industry and for America. After all, aren't we all trying to make more brassieres (or name your own product) at costs that will enable us to pay higher wages, which in turn will enable more and more people to buy more and more brassieres?

SUMMARY

	Left Hand	*Right Hand*
Old Method		
Operations	39	55
Transportations .	19	33
New Method		
Operations	24	23
Transportations .	10	15
Savings		
Operations	15	32
Transportations .	9	18

Note: The process charts from which these figures were taken, were made for clipping the thread ends on a brassiere that has 27 points to clip, the points being located as shown in the figure.

NO MACHINE BUILDER WOULD ADVERTISE LIKE THIS . . .



● This machine will run at only one speed. If operating conditions change, it's your lookout.

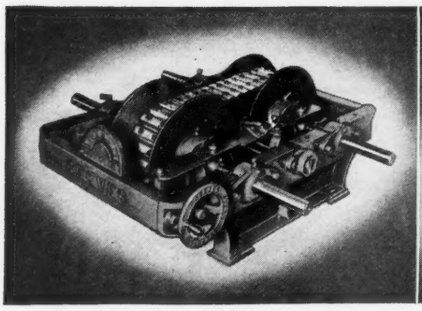
● Of course the machine designer and builder wouldn't say *that*. He knows, better than anybody, that it is impossible for him to decide the one best speed for *all* classes of work, for *all* conditions, for *all* grades of materials, and for *all* degrees of skill on the part of operators. And he knows, too, that making a statement of this kind would seriously interfere with sales.

Yet, *by implication*, he does say the same thing when he fails to provide the *positive and accurate variable speed control* which one of the three REEVES basic speed control units would give to the operator.

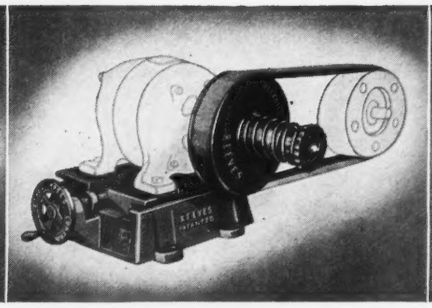
Manufacturers of nearly 1400 different machines have definitely overcome this handicap to sales and customer good will by including REEVES Speed Control as standard equipment. May we explain how variable speed may be *accurately* applied to your machines? Write us. No obligation.

REEVES PULLEY CO., DEPT. F-29, COLUMBUS, INDIANA

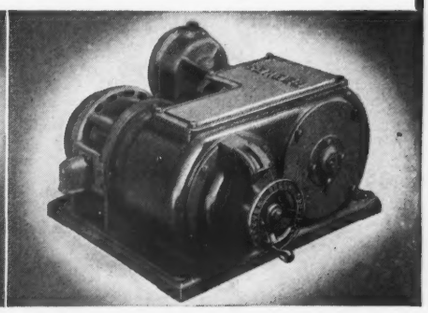
REEVES SPEED CONTROL



VARIABLE SPEED TRANSMISSION. Provides infinite speed adjustability over wide range. Accurate and positive at all speeds. Modern, compact open and enclosed designs, vertical and horizontal. Fifteen sizes—fractional to 100 h.p. Speed variations from 2:1 to 16:1 inclusive.



VARI-SPEED MOTOR PULLEY. Simplified development of Transmission. Mounts on standard shaft of any constant speed motor. Forms direct drive to machine. Sliding motor base is moved forward or back for speed changes. Seven sizes—fractional to 7½ h.p.; 3:1 range of variation.



VARI-SPEED MOTODRIVE. Combines in one compact, self-contained enclosure, constant speed motor, REEVES speed varying mechanism and reduction gears (where required). Available in space-saving horizontal and vertical types—¼ to 10 h.p. Speed variations 2:1 to 6:1 inclusive.

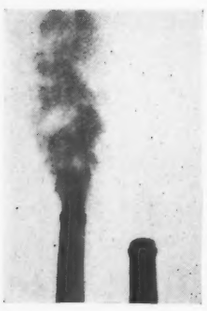
CONTROL THE DUST!

it controls your profits

INDUSTRIAL dusts constitute a complex problem of primary economic importance. Some dusts are valuable and should be salvaged. Others are a menace, a source of damage to your machinery and products, a nuisance to your workmen and neighbors. Frequently dusts are both valuable *and* a menace.

Buell Dust Collectors will solve this complex problem for you in a simple, practical, economical way. Employing the patented Van Tongeren system, their efficiency *pre*determined in accordance with the needs of the individual plant, Buell Collectors offer unique advantages throughout the *dust* range.

Those advantages are clearly and concisely explained in *Bulletin D81,* which will be sent free to any managing executive or operating engineer.



CONTROL THE SMOKE!

This photograph was taken after *one* of two stacks (twins as to boiler size, firing and load) had been equipped with a Buell Fly Ash Collector. After *both* stacks were so equipped the smoke nuisance was ended.

If *you* have a fly ash problem, if *you* want to be sure of high-efficiency, low-cost service, you will find your best approach to the subject in *Booklet A80*—free to any managing executive or operating engineer.

BUELL ENGINEERING COMPANY INC
12 Cedar Street, New York

buell DUST COLLECTORS

SALES OFFICES IN PRINCIPAL CITIES

What's New In Equipment

(Continued from page 96)

being inserted between the thermostat plunger and valve spindle in such a way that in the event of thermostat failure, the plug will collapse and the water valve will be forced wide open. Available in ⅜- to 1-in. sizes. Sarco Co., Inc., 183 Madison Ave., New York.

Spray Gun

"Sprayit" STR spray gun and cup can be used on air lines and portable compressors, and is convertible from bleeder to non-bleeder type. Gun body and cover are die-cast aluminum; 1-qt. container is aluminum; nozzles and fluid tips are of hardened steel. Has revolver grip, and filter in handle with drain to remove accumulations. Round, fan, and angle nozzles furnished with gun. The Electric Sprayit Co., Inc., 220 North Broadway, Milwaukee.

Rubber Mounting Insulator

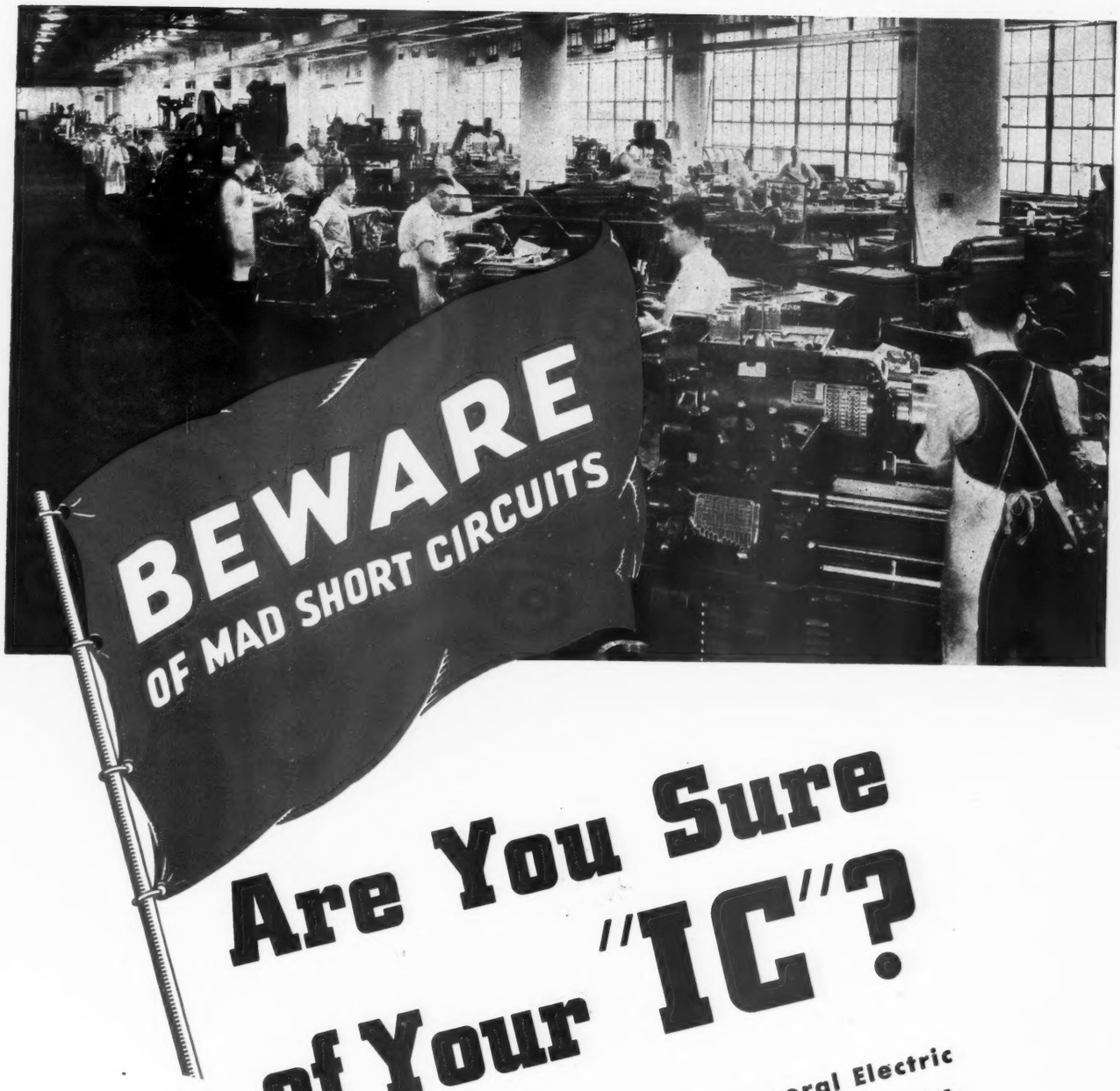
Deflection of Type 40 "Vibro-Insulator" is adjustable—can be regulated to provide either a soft or stiff type mounting. Consists of rubber vulcanized to two parallel metal disks drilled and tapped for a $\frac{5}{16}$-in. U.S.S. thread. The hole goes through the mounting. Deflection is varied by length of attaching screws, the longer screws giving less deflection and vice versa. Available size: one in. in diameter, one in. long. Carries maximum load in shear of 10 lb. per mounting. The B. F. Goodrich Co., Akron.

Fluorescent Lamp Equipment

Cove, recessed or trough lighting equipment, exposed or concealed applications, single lamp assemblies, continuous linear assemblies, suspended or surface mounted installations, are available for various fluorescent lamp installations. "Curtistrip" standard wiring channel, basis of all equipment assemblies, carries wire circuits and "Auxiliary," and supports covers, sockets, and reflectors. The channel, made of cadmium-plated steel, comes in 10-ft. sections, 2½ in. wide by 1⅝ in. deep. Lamps are available in three lengths and in a variety of colors. Reflectors, mounting brackets, straps, and other supporting fittings also are offered. Curtis Lighting, Inc., 1123 West Jackson Blvd., Chicago.

Fire-Hoze Nozzle

Tests show that the "Poweron" nozzle does not conduct electricity, is suitable for use on equipment carrying current up to 250,000 volts, and permits use of water in extinguishing all classes of fires —in combustible materials, flammable liquids and electrical apparatus. Its discontinuous stream forms a water curtain between the operator and the blaze. The nozzle is non-adjustable, is similar in size and appearance to the ordinary fire-hose nozzle, and may be attached to any standard fire hose. American-LaFrance-Foamite Corp., Elmira, N. Y.

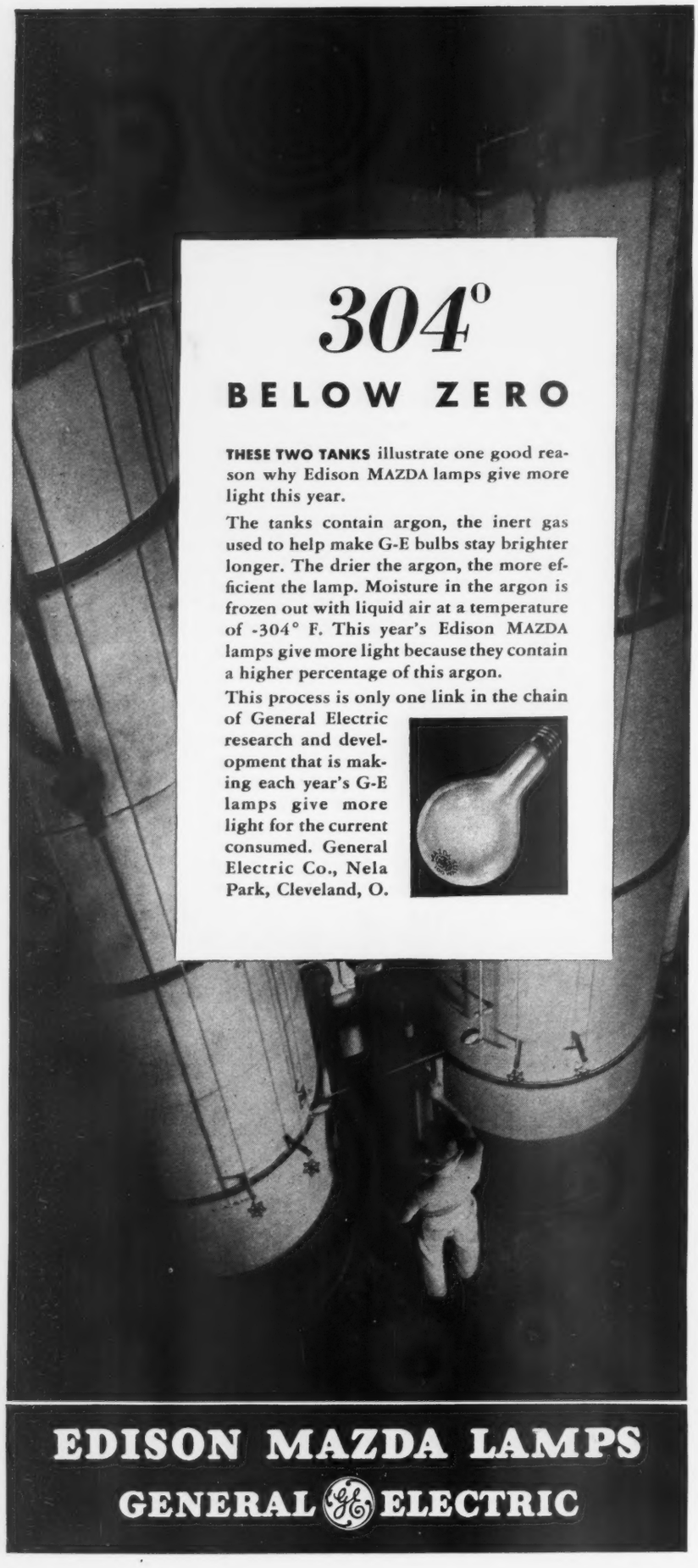


Are You Sure of Your "IC"?

BEGINNING next month, the General Electric Company will bring you, in these advertising pages, a series of messages on a vital problem in industry. They will explain the importance of a clear understanding of "I C," its relation to the safety of your personnel and equipment—and the solution of this problem.

GENERAL ELECTRIC

890-82


304°
BELOW ZERO
THESE TWO TANKS illustrate one good reason why Edison MAZDA lamps give more light this year.
The tanks contain argon, the inert gas used to help make G-E bulbs stay brighter longer. The drier the argon, the more efficient the lamp. Moisture in the argon is frozen out with liquid air at a temperature of -304° F. This year's Edison MAZDA lamps give more light because they contain a higher percentage of this argon.
This process is only one link in the chain of General Electric research and development that is making each year's G-E lamps give more light for the current consumed. General Electric Co., Nela Park, Cleveland, O.
EDISON MAZDA LAMPS
GENERAL ELECTRIC

TRADE LITERATURE

Arc Welding—Bulletin 412-A. "Shield-Arc" welders—uses, equipment, and techniques illustrated.—The Lincoln Electric Co., 12818 Coit Road, Cleveland.

Cement—Catalog H. G. 501. "Hy-tempite"—plastic, air-setting, high temperature cement for bonding refractory brick and shapes.—Quigley Co., Inc., 56 West 45th St., New York.

Chemicals—Catalog. Index of products, formulas, uses.—Glyco Products, Co., Inc., 148 Lafayette St., New York.

Control Panels—Form GEA-594B. Ratings of various types of automatic temperature-control equipment.—General Electric Co., Schenectady, N. Y.

Conveyor—Form J. Rubber conveyor, pipeline design, for handling liquids and small size materials.—Johns Conveyor Division, The Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland.

Cranes—Catalog 7474. Traveling, single I-beam, special-purpose, and low head-room types.—Robbins & Myers, Inc., Hoist & Crane Div., Springfield, Ohio.

Cylinders—Bulletin 35-A. Types of hydraulic cylinders—standard mountings, small diameter piston rod, 2 to 1 differential piston rod, double-end piston rod.—Hannafin Mfg. Co., 621-31 South Kolmar Ave., Chicago.

Drill—Bulletin. "Thor Drillmaster"—Portable, electric, ¼-in. light-duty drill.—Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago.

Electrical Equipment—Three Bulletins, 1110: rectangular "Pylets;" 1115: FS and FD series "Pylets;" 1125: "Vapor-tight" lighting fixtures.—The Pyle-National Co., 1334-58 North Kostner Ave., Chicago.

Electrical Equipment—Catalog. November, 1938, supplement to May, 1938, list of inspected electrical equipment.—Underwriters' Laboratories, Inc., 207 East Ohio St., Chicago.

Face Shields—Three Folders. Shields No. 20, 30, and 50, for spot and flash welding, acid handling, and so forth. Made of plastacele.—The Boyer-Campbell Co., Detroit.

Floors—Folder. Resurfacer for damaged floors.—Stonhard Co., 401 North Broad St., Philadelphia.

Fuse Puller—Folder 236-C. Horn fiber fuse pullers—Midget, pocket, giant, and jumbo sizes.—Trico Fuse Mfg. Co., Milwaukee.

Heaters—Pamphlet S327. Types of industrial unit heaters, with installations described and illustrated.—The Trane Co., La Crosse, Wis.

Hoists—Three Catalogs—7171: small electric hoists; 7272: electric worm-gear hoists; 7373: large electric hoists, trolleys. Ratings, specifications, wiring details.—Robbins & Myers, Inc., Hoist & Crane Div., Springfield, Ohio.

Hose and Tubing—Booklet. "The Fact Book of Flexible Metal Hose and Tubing." Types and forms, uses and installations.—Flexible Metal Hose & Tubing Institute, 150 Broadway, New York.

Hydraulic Tube Washer — Folder W-200-B4. Washer for surface condensers.—Worthington Pump & Machinery Corp., Harrison, N. J.

Illuminator—Circular 505. Inclined "Plainsite" water gage illuminated with "Neon" illuminator.—Wright Austin Co., 315 West Woodbridge St., Detroit.

Instruments—Folder G-37. Indicating, recording, controlling instruments.—The Brown Instrument Co., Wayne & Roberts Aves., Philadelphia.

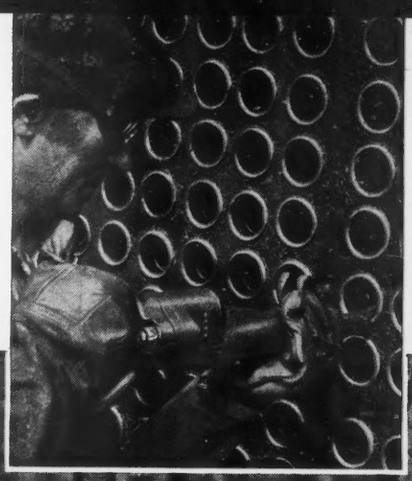
Instruments—Form 1326. Speed recorders and indicators; recording ohmmeters; pressure, time, liquid level recorders; long distance meters; portable current transformers.—The Esterline-Angus Co., Indianapolis.

Instruments—Catalog 48-a. Line of 3- and 4-in., round and square case, a.c. and d.c. panel instruments—ammeters, milliammeters, microammeters, voltmeters, single and polyphase watt-

Take it from this old timer . . . when he says that

J & L SEAMLESS STEEL BOILER TUBES

are, *"The best tubes we have handled in 40 years"*

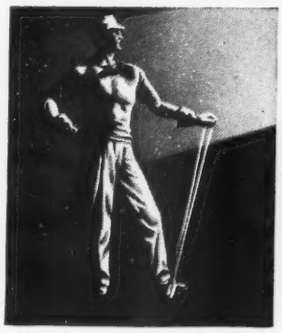


Mr. H. Wolford of H. Wolford & Company, Philadelphia, has been repairing boilers for over forty years. Read what he says about J & L Boiler Tubes—

> "For many years, we have used one make of Boiler Tube and thought they were best, but just a few weeks ago, we placed through a Philadelphia jobber an order for 192 of your 3" x 18' Seamless Steel Tubes and want to say that these tubes are the best for staying put and turning over that we have handled in forty years. From now on we will handle nothing but J & L Tubes."

You, too, will find that J & L Seamless Steel Boiler Tubes roll in faster and stay put . . . that J & L Boiler Tubes save you money on installation costs . . . and that their longer life and increased efficiency keep boilers at work earning profits instead of losing them.

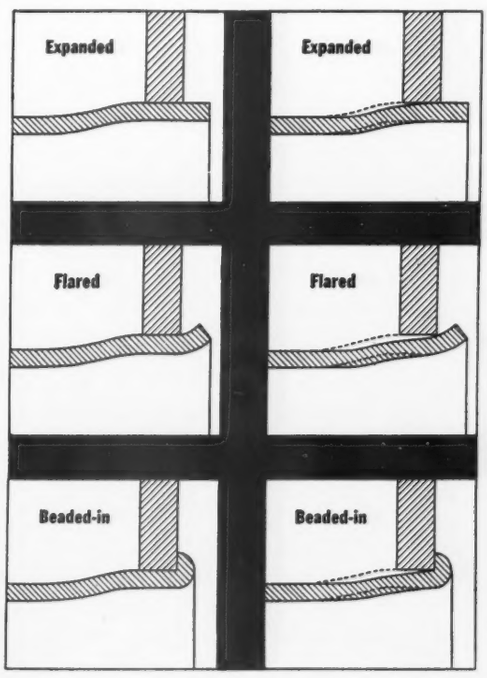
There can be no failure at or near a weld with J & L Seamless Steel Boiler Tubes . . . because there are no welds. They are rolled from solid billets of selected steel. When you need boiler tubes in a hurry, these easy working J & L Tubes are no farther away than your telephone. Call your J & L distributor. He has a complete stock of sizes 1" O. D. to 6" O. D. inclusive, which comply with all recognized boiler specifications.



Why High Ductility is Vitally Important

(a) Jones & Laughlin Seamless Tubes with their high ductility form a smooth, tight joint and "stay put" permanently . . . when they are expanded, flared and beaded in. See diagrams below.

(b) Tubes not sufficiently ductile resist forming and tend to pull away from the boiler plate. Such tubes require longer time for working and leave imperfect joints. See diagrams below.



J & L manufactures a complete line of seamless and welded steel tubular products. This includes seamless pressure tubes, condenser and heat exchanger tubes.

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Flange steel plates and firebox steel.

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AMERICAN IRON AND STEEL WORKS
PITTSBURGH, PENNSYLVANIA

MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

J & L ALWAYS MAKING FINER CARBON STEEL PRODUCTS FOR NEW AND BETTER USES

DISKONECT REFLECTORS

—MUCH EASIER TO SERVICE

● If you want good illumination, your reflectors must be removed now and then for cleaning. Make an easier job of it with the Diskonect—released or attached in an instant without fussing with tools or wiring. You needn't twist, tug or force. There's nothing to corrode or stick. It's all done with a simple, spring-set plunger in the hood which releases or locks the reflector and lamp as a unit. Diskonect Reflectors are offered in a variety of styles and sizes—an exclusive Goodrich feature.

See your Electrical Supplier

The Diskonect is equipped with the exclusive Goodrich socket which protects the lamp against vibration, lengthens lamp life. Ask your electrical supplier or write us for complete details.

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ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2904 N. OAKLEY AVENUE, CHICAGO, ILL.

meters, and pyrometers.—Roller-Smith Co., 233 Broadway, New York.

Iron and Steel Products — Catalog. 55-page catalog on wrought iron, tubular and flat rolled products, steel tubular products.—A. M. Byers Co., Pittsburgh.

Joint Cover—Bulletin. Self centering, self-anchoring type "Perfection" joint cover for copings, cornices, sills.—Dusing & Hunt, Inc., 1927 Elmwood Ave., Buffalo.

Lifters—Pamphlet, Electric, hydraulic, and hand-operated lifters for vertical transportation.—The Service Caster & Truck Co., 440 Somerville Ave., Somerville, Mass.

Lift Truck—Folder. "The Mighty Midget Mobilift."—Vaughn Motor Co., Portland, Ore.

Lighting Equipment—Page XR-44C-1. "Curtistrip" and other fittings for various fluorescent lamp installations.—Curtis Lighting, Inc., 1123 West Jackson Blvd., Chicago.

Lighting Fixtures — Bulletin. Uses and prices of fluorescent lighting fixtures operating on a.c.—The Miller Co., Meriden, Conn.

Magnetic Clutch—Bulletin 225. Single disk, multiple disk, and duplex type magnetic clutches.—Stearns Magnetic Mfg. Co., Milwaukee.

Materials Handling—Booklet. Uses and installations of "Monorail" for overhead handling equipment.—The American Monorail Co., 13107 Athens Ave., Cleveland.

Materials Handling—Form G5-38. Handling materials by "Tramrail."—The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Measuring Instruments—Catalog 38. Precision instruments, gages, indicators; dimension tables, prices.—Federal Products Corp., 1144 Eddy St., Providence, R. I.

Megohmmeters—Bulletin 405. Type OK megohmmeter for insulation testing.—A. H. Volker, Rm. 500, 27 Park Place, New York.

Motors—Manual 21-121. Installation, care, adjustment of fractional-horsepower, capacitor, single-phase motors.—Century Electric Co., St. Louis.

Motors—Folder. Single-phase motors—construction, sizes, and prices.—Dayton Electric Mfg. Co., 511 South Green St., Chicago.

Motors—Two Bulletins. 148: totally inclosed, pipe-ventilated motors. 146: "Slo-Speed" motors adaptable to any type of application.—Sterling Electric Motors, Inc., 5401 Telegraph Road, Los Angeles.

Motors—Descriptive Data 3530. Crane and hoist wound-rotor induction motors.—Westinghouse Electric & Mfg. Co., East Pittsburgh.

Potentiometer — Bulletin DMF 763. Portable indicating potentiometer for testing and standardizing service instruments and thermocouples.—The Foxboro Co., Foxboro, Mass.

Pumps—Bulletin W-423-B5. Vertical triplex single-acting power pumps.—Worthington Pump & Machinery Corp., Harrison, N. J.

Pumps—Bulletin W-318-B1B. Balanced, multi-stage, volute, centrifugal pumps.—Worthington Pump & Machinery Corp., Harrison, N. J.

Refractory Maintenance—Folder T-S-2. "Thermo-Stucco" for refractory maintenance on boilers and furnaces.—Chicago Fire Brick Co., 1467 Elston Ave., Chicago.

Rust Prevention—Bulletin. Twenty-four pages on "Parkerizing"—a method for rust prevention.—Parker Rust Proof Co., Detroit.

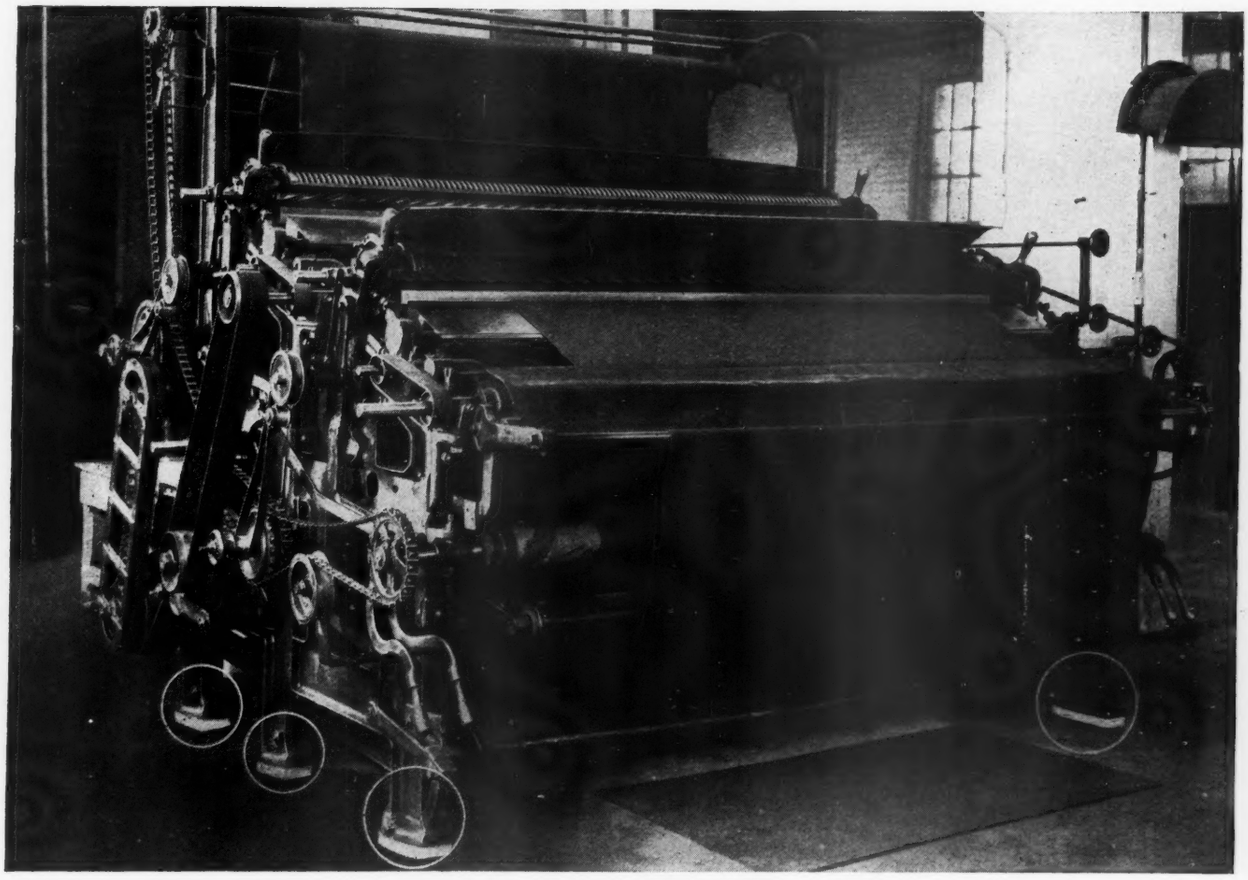
Saw—Folder. "Speedmatic" electric hand saws.—The Porter-Cable Machine Co., 1714 North Salina St., Syracuse, N. Y.

Starter—Form GEA-2964. Full-voltage magnetic motor starter.—General Electric Co., Schenectady, N. Y.

Steel—Booklet. Certified Alloy Plan for reducing heat-treating costs. Digest of standard and special alloys.—Joseph T. Ryerson & Son, Inc., 16th & Rockwell Sts., Chicago.

Tachometers.—Bulletin 1585. Vibrating-reed hand tachometers measure

It's No Trouble At All . . .



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Felters Certified Unisorb can be installed under your machinery quickly and inexpensively. Unisorb has proven, through practical experience and research, to be an effective and economical vibration aid.

NO BOLTING DOWN
NO RIPPED-UP FLOORS
NO LONG DELAYS

We have published an interesting illustrated booklet on Vibration Control, which we will be happy to send you upon application on your company letterhead.

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* Reg. U. S. Pat. Office

DUST PROBLEMS SOLVED at LOW COST with American "DUSTUBE" DUST COLLECTORS

American "Dustubes" combine high efficiency with low cost of operation and maintenance:

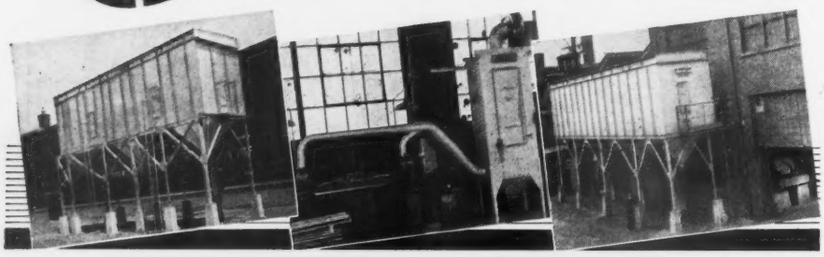
1. Low over-all pressure-drop means decreased fan horse power and long cloth life.

2. The positive acting shaking device requires a minimum of attention, and effectively frees the tubes of accumulated dust.

3. Scientifically designed inlet and outlet chambers insure uniform distribution of air, which results in better collection, infrequent shaking, and maximum filter tube life.

Let an experienced American engineer survey your plant and analyze your dust problems. For further information write for Book 22.

The American Foundry Equipment Co.
374 South Byrkit St. Mishawaka, Indiana



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In design, construction and equipment, this continuous strip mill, covering 18½ acres in the Cuyahoga Valley of Ohio, represents the application of latest scientific developments in industrial engineering.

The roofing for this giant structure was entrusted to The Philip Carey Company. Insulation Board, applied over a steel deck, was followed by a Carey Built-Up Roof, with a slag top. 90 carloads of roofing and Insulation Board were required for the job.

With a background of 66 years of manufacturing experience, Carey knows how to build extra years of service into Built-Up Roofs. No job is too large or too small for the Carey approved roofer organization to handle efficiently. Write for book.

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Waterproofing Materials . . . Expansion Joint . . . Asbestos Paper and Millboard

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Dependable Products Since 1873
BRANCHES IN PRINCIPAL CITIES

speed and vibration.—James G. Biddle Co., 1211-13 Arch St., Philadelphia.

Temperature Controls — Data Sheet 225, Bulletin LC. Hydraulic action heating controls and fan or warm-air limit switch.—Julien P. Friez & Sons, Baltimore, Md.

Threading — Pamphlet. Threading Equipment. Landis Machine Co., Inc., Waynesboro, Pa.

Tools—Catalog 2. Standard "Kennametal" steel and metal-cutting tools and blanks; also methods of grinding and brazing.—McKenna Metals Co., Latrobe, Pa.

Truck—Folder A-8416. Specifications and uses of the "IZ" Load Carrier Truck.—The Elwell-Parker Electric Co., Cleveland.

Trucks and Trailers—1939 Booklet. Size and weight restrictions for 1939.—The Four Wheel Drive Auto Co., Clintonville, Wis.

Unit Heaters—Catalog W-N-104. Seventy-two pages illustrating "Standard," "Thermadjust," and "Valve Controlled" large-size unit heaters.—John J. Nesbitt, Inc., Holmesburg, Philadelphia.

Unit Heater — Folder. Suspended-type, gas-fired unit heater. Output of 500,000 B.t.u.—Dravo Corp., 302 Penn Ave., Pittsburgh.

Valves — Bulletin EV-617. Methods used in the Edward Laboratories for research and production testing of valve materials.—The Edward Valve & Mfg. Co., Inc., East Chicago, Ind.

Vibration Dampener—Bulletin. "Unisorb" pads isolate machinery and absorb vibrations.—The Felters Co., Inc., 210 South St., Boston.

Vise—Folders, on the "All-Angle" vise and "Pilot" hole saws.—Fray-Mershon, Inc., 515 West Windsor Road, Glendale, Calif.

Voltage Regulators — Leaflet 2326. V-O and V1 rocking contact generators for automatic control of small a.c. and d.c. generators.—Allis-Chalmers Mfg. Co., Milwaukee.

Winches—Catalog 7575. Electric, spur-gear, worm-gear, and friction-clutch types.—Robbins & Myers, Inc., Hoist & Crane Div., Springfield, Ohio.

BOOKS

PUBLIC EMPLOYMENT SERVICE IN THE UNITED STATES

Raymond C. Atkinson, formerly of the Ohio Institute; Louis C. Odencrantz, Director of Personnel for the New York State Division of Placement and Unemployment Insurance; Ben Deming, Assistant Director of the Indiana State Employment Service. Public Administration Service, Publications Division, 1313 East 60th St., Chicago. 482 pages, graphs, tables, index. $3.75.

Embracing organization, administration, and procedure of public employment service, this book deals with the problems arising in the development of a nation-wide system of employment service and the methods for attaining that objective. Written for persons within the service, for students of labor problems, and those concerned with unemployment and the administration of unemployment compensation, it is based on a field survey of public employment services undertaken in 1936 and the first half of 1938, and covers 25 states.

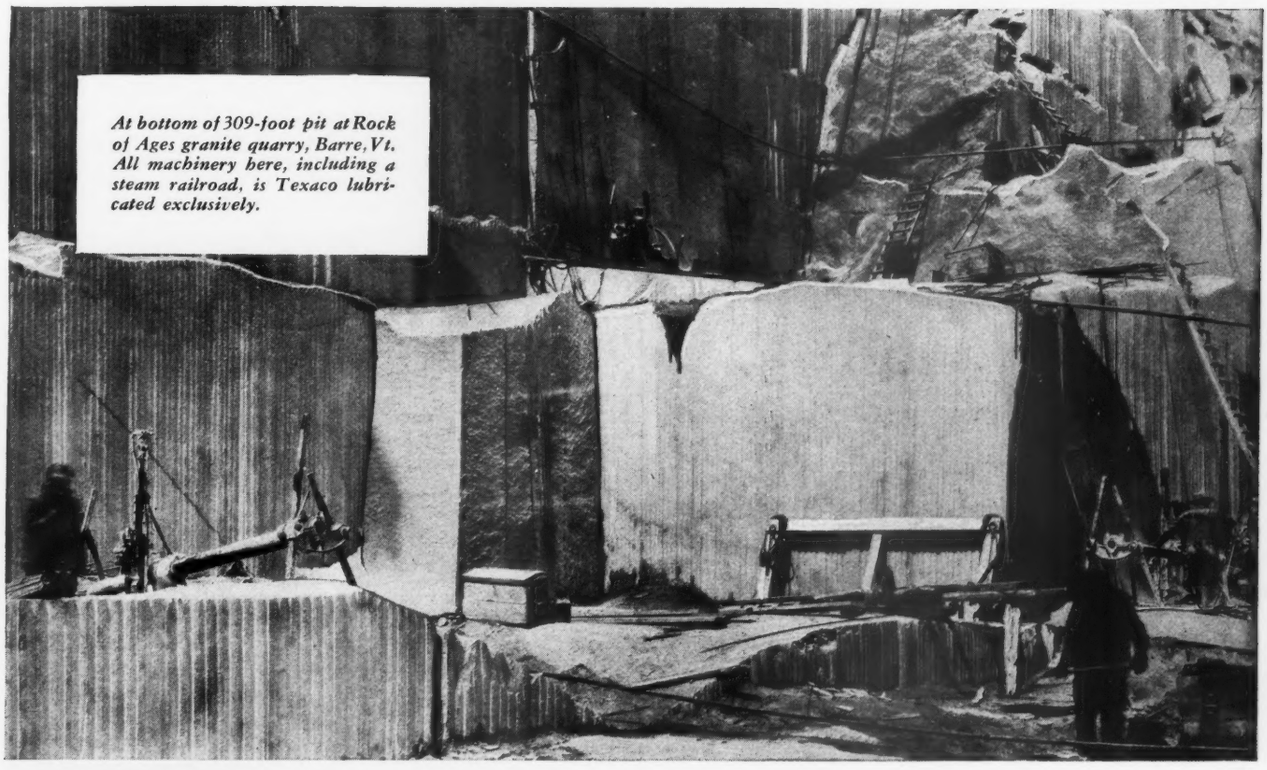
INDUSTRIAL RESOURCES AND OPPORTUNITIES IN THE FAR WESTERN STATES

A two-volume report to be published in February by Industrial West, Inc., 111 Sutter St., San Francisco. Price will be approximately $20.

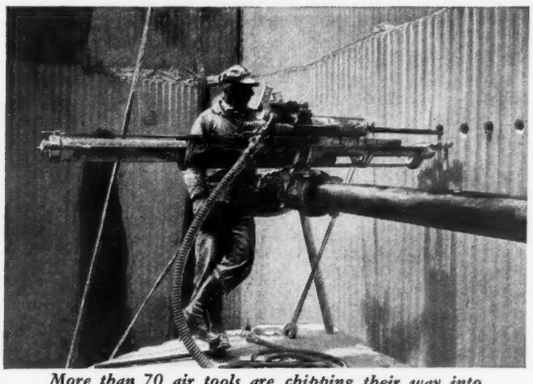
All types of data relative to industrial expansion in the 11 far western states. In addition to detailed treatment of individual industries that can be developed in the region, the report will include sections dealing with trends in

Worlds' largest

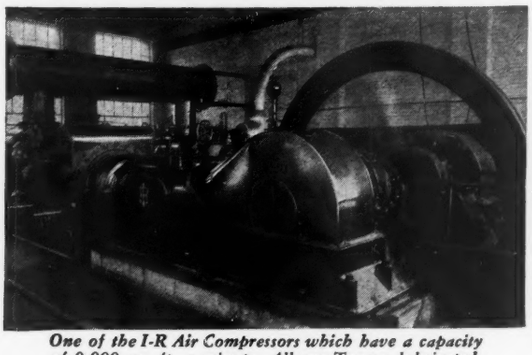
MONUMENTAL GRANITE QUARRY



At bottom of 309-foot pit at Rock of Ages granite quarry, Barre, Vt. All machinery here, including a steam railroad, is Texaco lubricated exclusively.



More than 70 air tools are chipping their way into deep granite here. Tough service, but Texaco helps to keep them on the job.



One of the I-R Air Compressors which have a capacity of 9,000 cu. ft. a minute. All are Texaco lubricated.

A Texaco User For 14 Years

Rock of Ages Supt. W. R. Reilly who knows—and gets—his Texaco Lubricants from Mr. W. G. Reynolds of Reynolds & Son.

OPERATING THE COUNTRY'S LARGEST granite quarry at Barre, Vt., the Rock of Ages plant is extensive and very efficient. Granite is hard and heavy. ★ Throughout this property, whether it be drills, compressors, motors, hoists, or their steam railroad, all lubrication for 14 years has been TEXACO. ★ 2186 warehouses make Texaco available to everybody. Texaco engineers will help you select and apply. To order, phone locally or write: The Texas Company, 135 East 42nd St., New York City.

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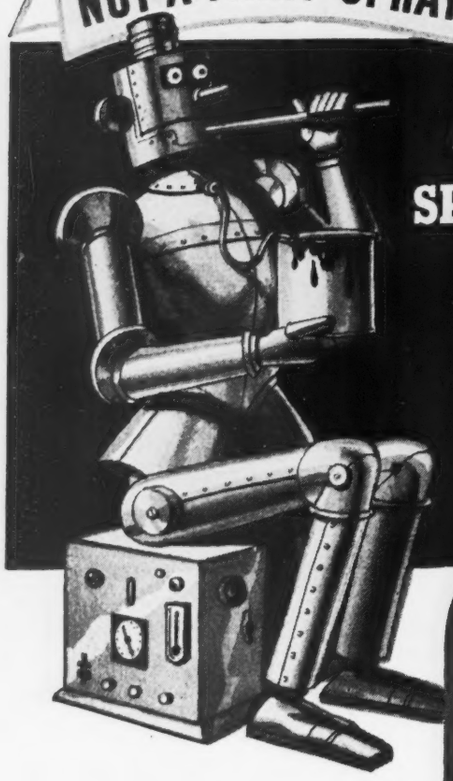
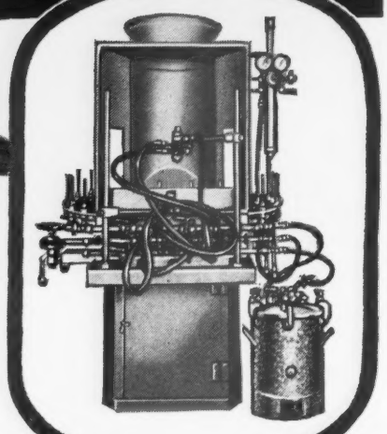
Texaco Dealers invite you to tune in The Texaco Star Theatre — Every Wednesday Night — Columbia Network — 9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

NOT A PAINT-SPRAYING ROBOT, BUT...

AN *Automatic* SPRAY-PAINTING MARVEL OF THIS MODERN HIGH-SPEED AGE!





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Hose connections
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DEVILBISS SPRAY SYSTEMS

the amount, locations, and kinds of manufactures. There will also be sections on agriculture, mineral and water resources, fuel costs, power production, transportation facilities, taxes, labor conditions and financial services. Tables, charts, maps, and diagrams will be included.

Because Industrial West, Inc., is not a publishing concern, the number of copies to be printed will be gaged largely by requests received in advance of printing.

COST ACCOUNTING

Clarence L. Van Sickle, Professor of Accounting, University of Pittsburgh. Harper & Brothers, 49 East 33d St., New York. 998 pages, problems, charts and tables, index. $7.50.

Fundamentals and procedures for production costs, administrative and marketing costs, and budgetary control. Aims to show the relationships between cost accounting and the factory, marketing, and administrative fields of management. Encyclopedic in scope, it discusses books and materials, cost elements, systems, factors, and applications.

•

ON THE CALENDAR

FEBRUARY

5–11, National Electrical Manufacturers Association, Mid-Winter Conference, New York. W. J. Donald, Managing Director, 155 East 44th St., New York.

15–17, American Management Association, Personnel and Industrial Relations Conference, New York. Alvin E. Dodd, President, 330 West 42d St., New York.

23–25, American Society of Mechanical Engineers, Spring Meeting, New Orleans. C. E. Davies, Secretary, 29 West 39th St., New York.

MARCH

7–10, American Management Association, Ninth Packaging Conference and Exposition, New York. Alvin E. Dodd, President, 330 West 42d St., New York.

MAY

2–4, Chamber of Commerce of the United States, Annual Meeting, Washington, D. C. Ralph Bradford, Acting Secretary, 1615 H St., N. W., Washington, D. C.

8–12, National Fire Protection Association, Annual Meeting, Chicago. Franklin H. Wentworth, Managing Director, 60 Batterymarch St., Boston.

•

Factory Management and Maintenance is a consolidation of *Factory and Industrial Management* and *Maintenance Engineering.*

Factory and Industrial Management grew from consolidations, mergers, or absorptions involving the following publications: *The Engineering Magazine; Industrial Management; Factory, the Magazine of Management, Management Engineering; Administration; Management and Administration; Management and Administration in Manufacturing Industries; Manufacturing Industries.*

Maintenance Engineering grew from consolidations, mergers, or absorptions involving the following publications: *Review of the Telephone and Telegraph; Electrical Review; Western Electrician; Electrocraft; Electrical Engineering; Electrical Review and Industrial Engineer; Industrial Engineer; Industrial Engineering; Industry Illustrated.*

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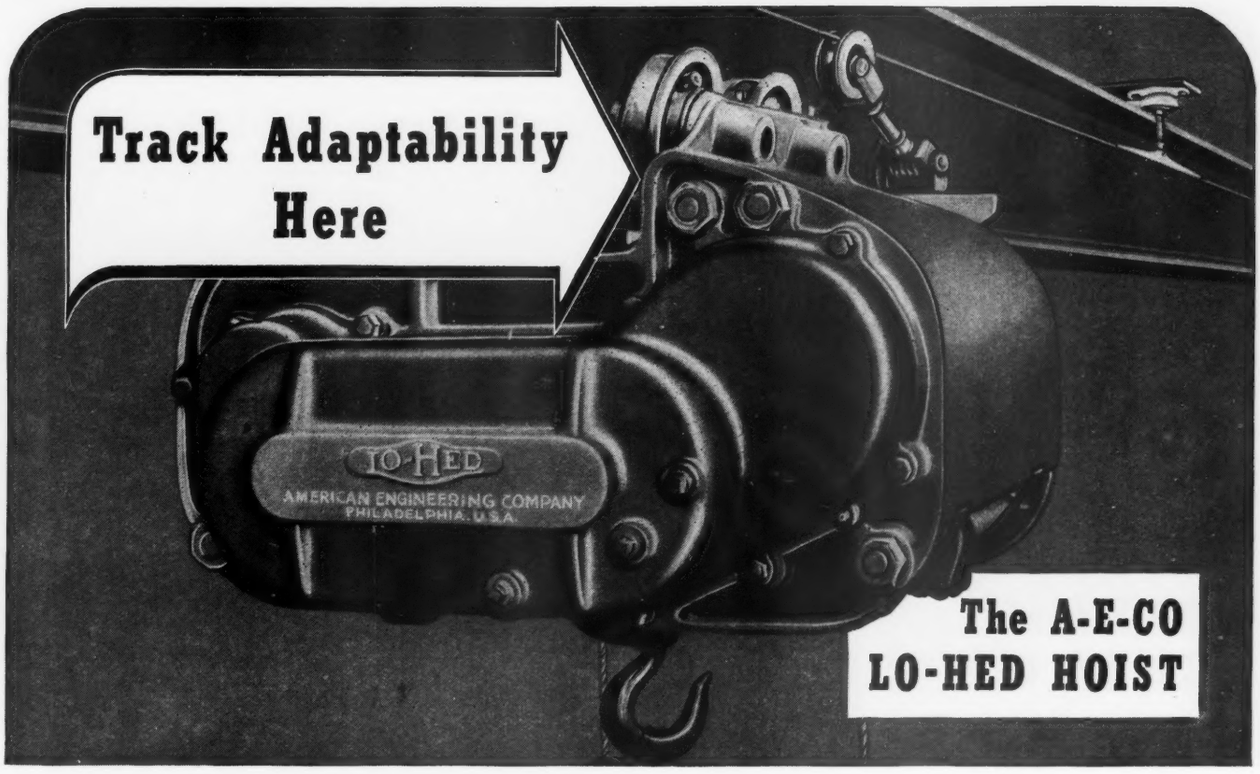

Choose THE hoist which will run on standard I-beams or tracks of any make. Ask the nearest A-E-CO representative* to tell you how easily Lo-Hed Hoists can be adapted to run on your track system. Ask him to explain Lo-Hed's exclusive features that give you fast, dependable operation with minimum maintenance cost. Let him show you Lo-Hed's uses in scores of industries. Find out *why* Lo-Hed is the logical hoist for EVERY purpose and why it is the *only* hoist for low headroom conditions. A-E-CO Lo-Hed Hoists are built in many standard models, from ¼ to 12 ton capacities.

*Classified phone directories list the local A-E-CO representative in principal cities. Call him in . . . or write us for the new hoist catalog. This catalog clearly shows you how to select the specific hoist for your requirements.
Other A-E-CO Products:
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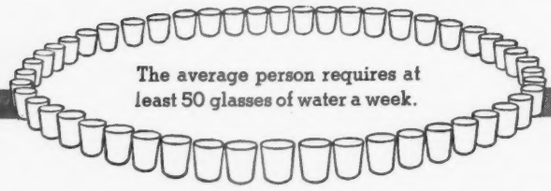
Marine Deck Auxiliaries
Hele-Shaw Fluid Power.
Means O. K. To Run Here
A-E-CO Lo-Hed HOISTS
AMERICAN ENGINEERING COMPANY
2426 ARAMINGO AVENUE, PHILADELPHIA, PA.



BURNOUT-PROOF MOTORS

SLASH REPAIR COSTS

Engineered right out of the water cooler maintenance picture. That's what Westinghouse has done to burnouts, a common and costly source of motor trouble. Brushes and commutators, the cause of burnouts, have been eliminated. In addition, greater efficiency makes possible a smaller motor that uses less current, and yet has ample reserve power.

Other Exclusive "PLUS VALUE" Features

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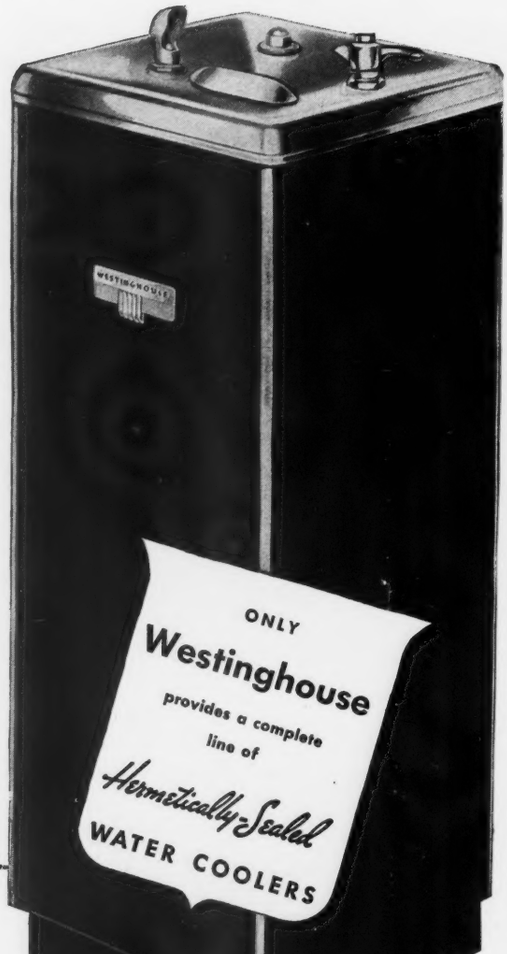
No grit, dirt, rust or corrosion . . . the things that cause most machinery to wear out, can harm the Westinghouse mechanism because it is Hermetically-sealed inside an airtight case of solid steel.

Because it is Hermetically-sealed, Westinghouse provides a plan for five years' protection on the sealed-in mechanism.

This is based on the EXTRA years of trouble-free performance which experience shows you can confidently expect.



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new machinery . . . when modernizing old equipment . . . when designing new products.

profitable applications of Dodge Drives.

Delivering POWER
-- to Production Machines!

THIS Dodge Modern Group Drive in a Mid-Western Metal working plant has stepped up production and cut costs . . . For example: in one group six machines are operated by a 7½ H.P. motor. To take care of peak loads 3 H.P. motors on each machine would have been necessary had individual drives been installed, which would have made 18 connected horsepower instead of 7½ H.P. Besides the cost of these six motors it would have been necessary to add the price of six controls, switches and proper wiring. Friction losses are eliminated by the use of Dodge-Timken Hanger Bearings. These are supported in pressed steel 4 pt. Hangers which applies to countershafts as well as lineshafts. The use of standard split cast iron, and steel pulleys along with compression couplings made keying of shafts unnecessary . . . "The Right Drive for Every Job" . . means free flowing power . . it typifies Dodge . . Because in the Dodge line is found a complete and economical solution for every transmission problem . . . In every industry Dodge-engineered and Dodge-built power drive units are serving to make operations smoother at lower costs.

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Think of **DODGE** MISHAWAKA

. . . when planning a new plant . . . when adding a new department . . . when installing new machinery . . . when modernizing old equipment . . . when designing new products.

Send for this book — "Pointing for Profit" —it will suggest many profitable applications of Dodge Drives.

Carefully Built for CARE-LESS SERVICE

Extra safety that relieves care and worry about possible accidents is built into Dayton Safety Ladders.

Good materials, good workmanship, correct design assure you of the utmost safety and economy in a Dayton—the ORIGINAL safety ladder.

Dayton Safety Ladders are light and easy to carry. Straight back allows close work in corners or against walls. Moderately priced in sizes 3 to 16 feet.

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DAYTON Safety Ladder

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● Send for our Catalog No. 5 showing a complete line of accident prevention equipment.

WHEN you send a gang of men to open or close a stubborn freight car door, you increase costs and invite injuries.

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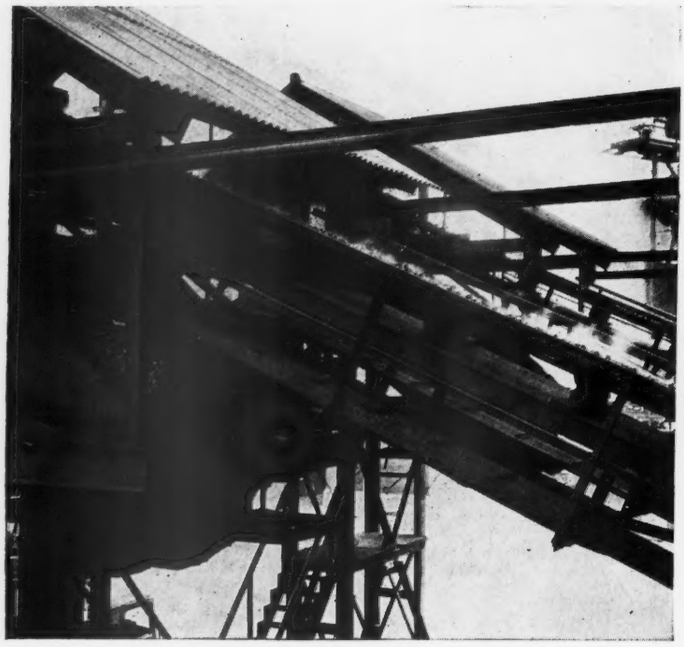
This tried and proven ONE-MAN tool is now available at only $14.50. If after ten days trial you are not more than satisfied, return the "Monarch" Car Door Opener and your money will be refunded immediately.

Dept. 5

The Mining Safety Device Company

Bowerston, Ohio, U.S.A.

NEOPRENE CONVEYOR BELT SPECIFIED FOR HOT, OILY COKE



THE PROBLEM: What material should be specified for the cover of a conveyor belt carrying hot coke sprayed with oil for a well-known coke plant? Designers knew that the service life of a rubber belting exposed to heat is short enough—with exposure to oil, in addition, the service life would be even shorter.

THE SOLUTION: Laboratory tests on a cover compound made of neoprene, Du Pont's chloroprene rubber, showed it superior to all materials tested in its resistance to oil and heat. So a neoprene conveyor belt was constructed and installed in the coke conveyor, where it is still giving perfect service after more than a year of continuous use.

THE MATERIAL: Neoprene resembles natural rubber in strength, elasticity and toughness . . . yet it is far more resistant to oils, gasoline, heat, sunlight, aging, even corrosive acids and gases. For this reason, many products used in industrial plants are made of neoprene. Plant truck tires, gloves, shoe soles and heels, portable drop cord, oil and air hose . . . hundreds of long-lived, money-saving products.

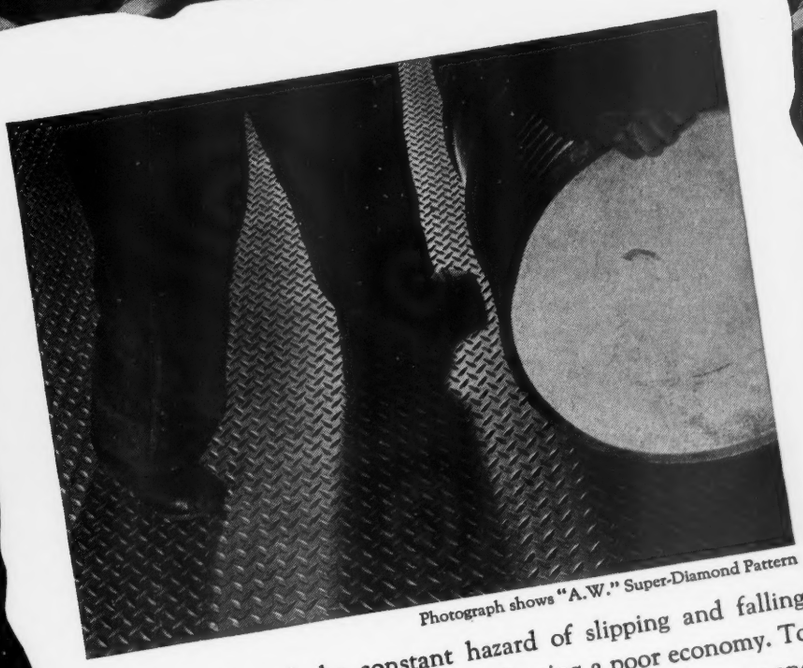
A SUGGESTION: We suggest you specify neoprene whenever flexible, resilient parts must withstand oil and heat. Yes, and we suggest you investigate the profitable possibilities of using neoprene in your manufactured articles. Keep abreast of new uses for neoprene by writing for your free monthly subscription to the newsy "Neoprene Notebook."

DU PONT REG. U.S. PAT. OFF. **NEOPRENE**

E. I. DU PONT DE NEMOURS & CO., INC.

RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

NOW—Safe Floors that Save You Money



Photograph shows "A.W." Super-Diamond Pattern

Heavy traffic and the constant hazard of slipping and falling accidents make ordinary industrial flooring a poor economy. To get maximum service from traffic aisles, stair treads, runways and catwalks . . . to help men and equipment to move safely and swiftly, use "A.W." Rolled Steel Floor Plate. Easy to clean and quick to drain. Oil-proof, heat-proof, crack-proof. Can be cut to any shape and installed without disturbing production. No maintenance expense because toughest traffic will not damage or impair it. If you want to know how little "A.W." Rolled Steel Floor Plate costs in terms of trouble-free floor protection, write for literature showing five patterns and giving complete engineering data.

"A.W." *Rolled Steel* FLOOR PLATE

ALAN WOOD STEEL COMPANY

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You Build for *Safety, Permanence, Long-Run Economy* — — with

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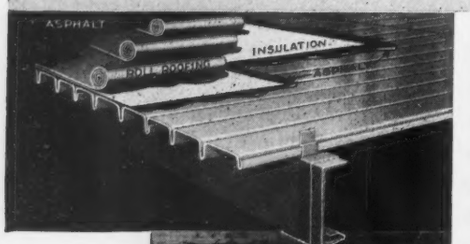
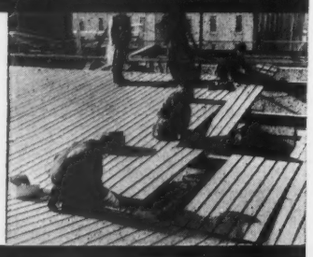
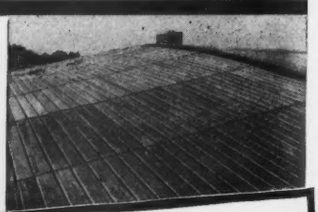


Attaching Purlin Clip



No mess to clean up



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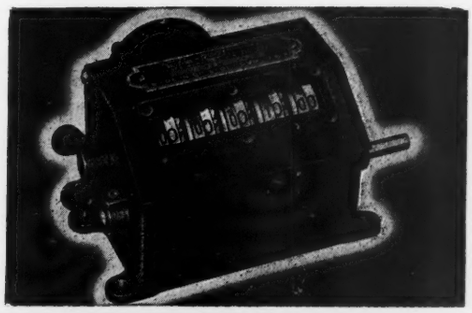
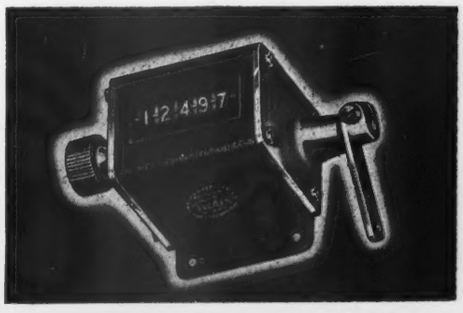
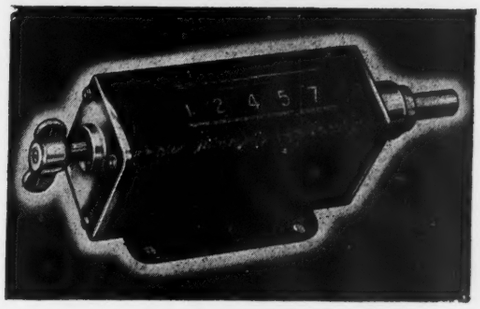
There are Veeder-Root Counters for every type of production and office machine . . . for mechanical, electrical, and manual operation. *Write for catalogue G-39.*



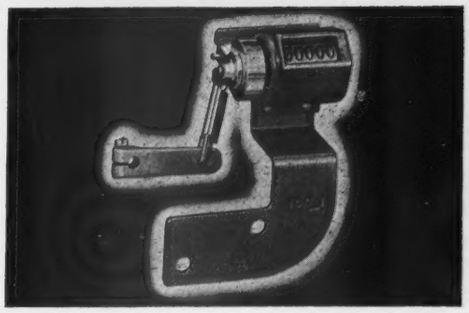
Controls Machine Runs
(*Left, Above*)
This Predetermining Counter prevents overruns and shortages on winders, fast automatics, etc., running up to 2500 r.p.m. Shuts down machine when desired.



For High Speed Work
(*Left, Below*)
This High Speed Resetting Counter operates at 8,000 counts per minute in direct-drive type . . . 2,000 in revolution type.



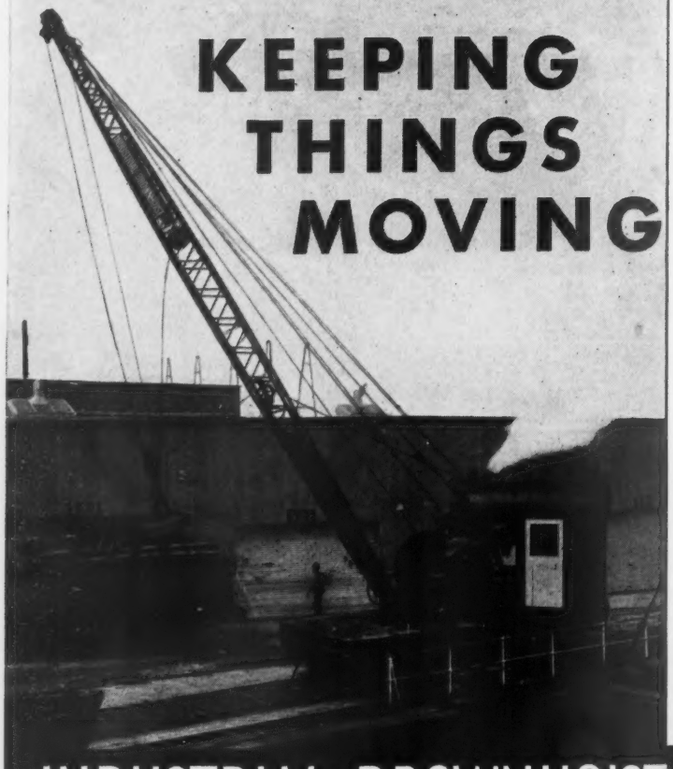
For Office and Light Production Machines
(*Right, Above*)
Small Reset Counters count strokes or revolutions. May be furnished with totalizing register.



Accounting & Typing
(*Right, Below*)
This Production Computator records each keystroke on typewriters and accounting machines, showing one figure for each 10, 100 or 240 strokes. Provides accurate basis of wage-payment and bonus systems.

VEEDER-ROOT INCORPORATED, HARTFORD, CONNECTICUT

Offices in Boston, Chicago, Cincinnati, Cleveland, Detroit, Greenville, S. C., Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Montreal, Canada, Buenos Aires, Mexico City, London, Paris, Tokio, Shanghai, Melbourne



KEEPING THINGS MOVING

One shirker in a whole production line . . . be it man or machine . . . can cause no end of trouble. American industry is the envy of the world today simply because, through better coordination of effort, we have learned how to achieve mass volume at low cost and with higher wages than is possible in any other country.

The secret of our success, of course, lies in the fact that better materials and machinery are constantly out-moding old methods. While studying your cost records do not overlook one of your most important operations . . . materials handling. There, one inefficient machine can drain profits as much as a whole department of shirkers.

Nowhere in industry during the past decade have greater strides been made toward lower costs than in locomotive cranes. If you have not kept in touch with this progress or recently studied your own handling costs, ask us to prove it. There is an Industrial Brownhoist of just the right type and size for your work.

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4 Models

The Burgess Acousti-booth blots up noise. Thus you talk and hear in quiet. Learn how this booth absorbs noise. Write for bulletin describing the 4 different models.

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● In factory, shipping room, and office, noise interferes with phone service. Noise often causes serious misunderstandings of important instructions. Best solution to this problem is the Burgess telephone Acousti-booth. Instead of trying to shut out noise, the Burgess booth "blots it up." So successful is this principle that hundreds of manufacturers now use Burgess booths. Unless you are using Burgess booths, you cannot get maximum plant telephone service.

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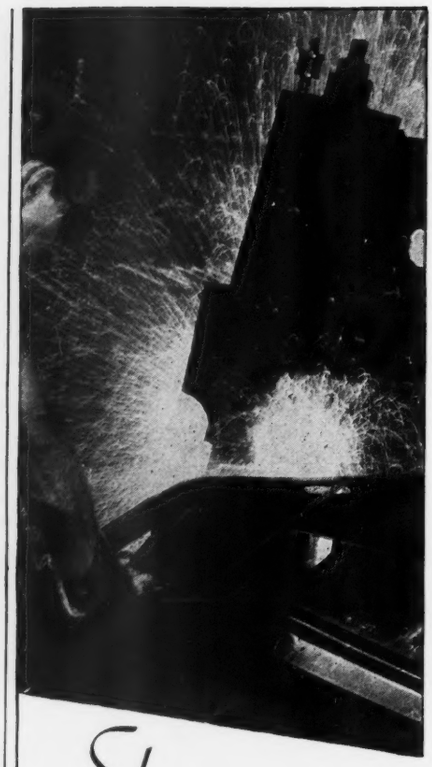

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1 ELIMINATE
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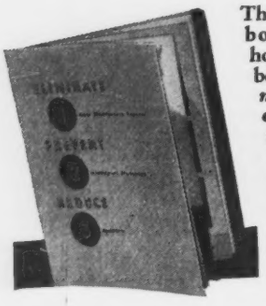

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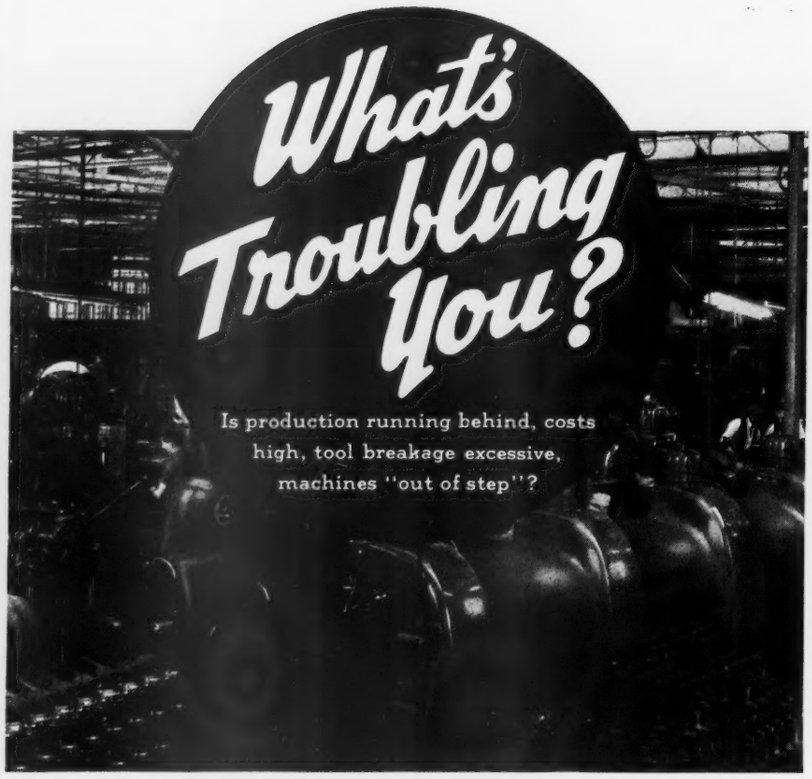

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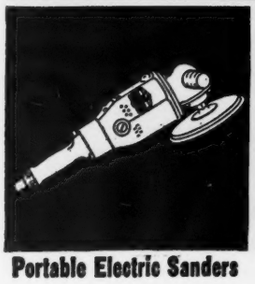

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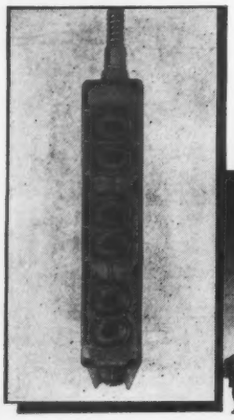
MULTIPLE OR SINGLE SPEED FOR ELECTRIC CRANES AND HOISTS!



Shepard Niles multiple speed push button control for all 6 travel motions applied to 3-motor electric traveling crane.

● Shepard Niles multiple speed push button control provides 5 selective speeds by one push button for each travel motion. Each button as it is pressed inward makes five electrical contacts, corresponding to five independent speeds in each direction of travel.

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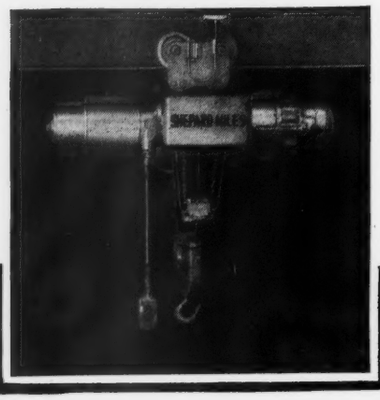

Shepard Niles LiftAbout equipped with single speed push button control.

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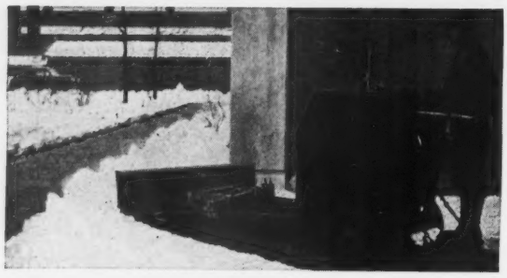
The plow for low cost snow removal. Attach in a few minutes to platform of any power lift-truck.



Perhaps your plant has *not* escaped the costly problem of snow removal this winter. Some sections have had heavy snows, but where SILVER BLADE is on the job, this plow will save its cost again and again. During the two months of snow ahead of you and for winter after winter to come, SILVER BLADE plows will pile up untold savings in plant operating time and snow removal costs. NOW is the time to get facts. Mail the coupon below today!

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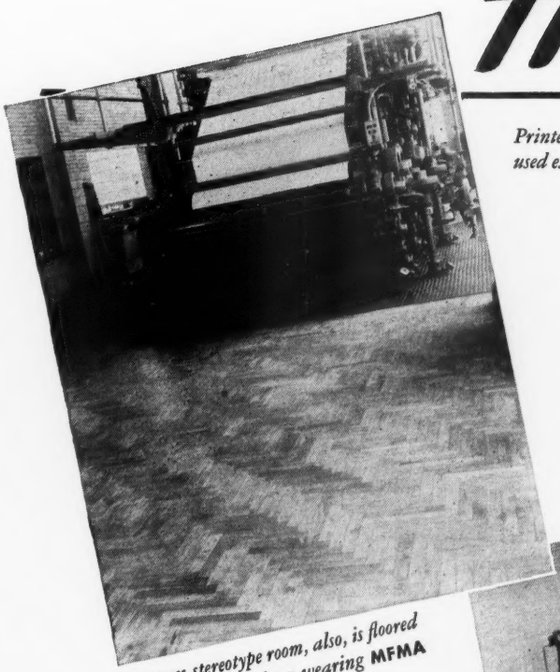
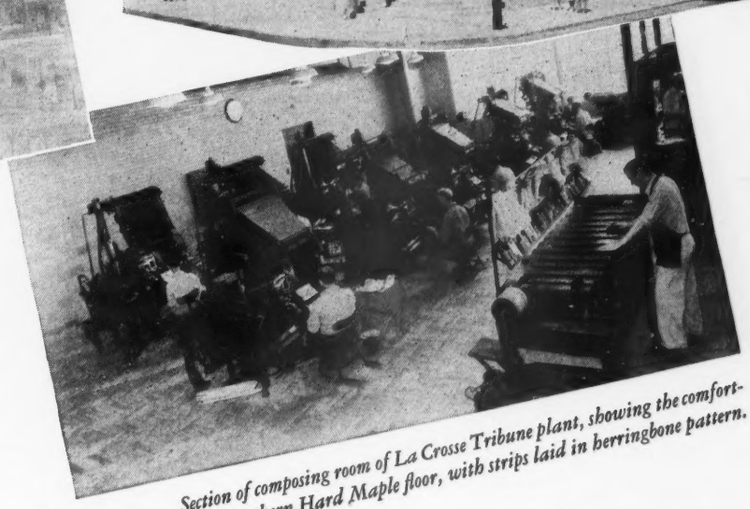


The press-stereotype room, also, is floored with economical, long-wearing **MFMA** *Northern Hard Maple.*



Section of composing room of La Crosse Tribune plant, showing the comfortable Northern Hard Maple floor, with strips laid in herringbone pattern.

Old in proven service...
*New** in modern utility

* Northern Hard Maple's long-proven economy is well known to engineers. But NEW factors, as well, influence their special interest in Hard Maple for modern plants.

This flooring builds both efficiency and contentment. Trucks and men move quickly over its smooth, resilient surface. Warm and dry, clean and sanitary, it protects health as it reduces fatigue. Its bright, cheery appearance warms up the cold business of industrial production.

A brute for punishment, it is yet the most friendly flooring to workmen—a pleasant, wholesome contribution to contentment, that can influence the whole character of an industrial plant. This, while giving management the lowest of costs for maintenance, for cleaning and per-year-of-service.

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MAPLE FLOORING MANUFACTURERS ASSOCIATION
1787 McCormick Building, Chicago, Illinois

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Look for the **MFMA trademark, indented and stamped on the wood. It assures association guaranteed grading and supervision, of the flooring you buy.

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(NORTHERN HARD)

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Here's How!

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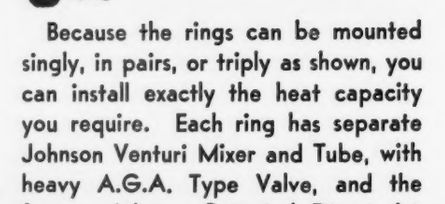

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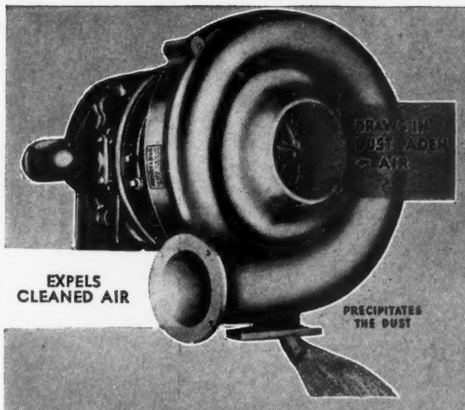

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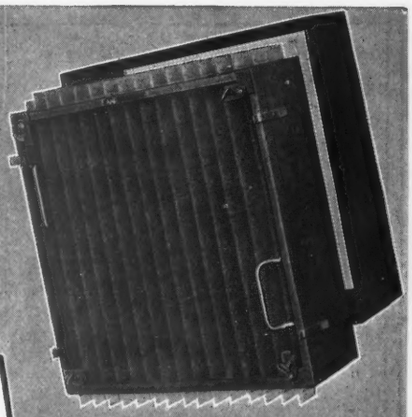

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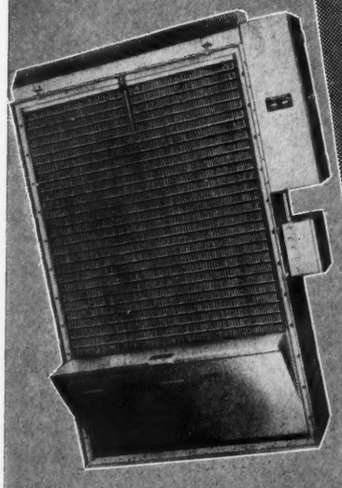

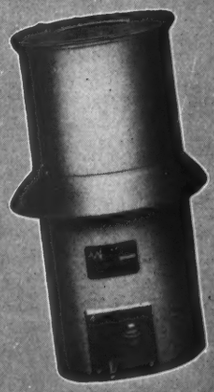

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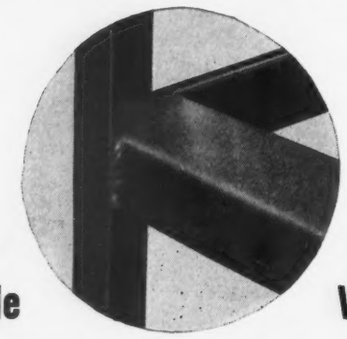

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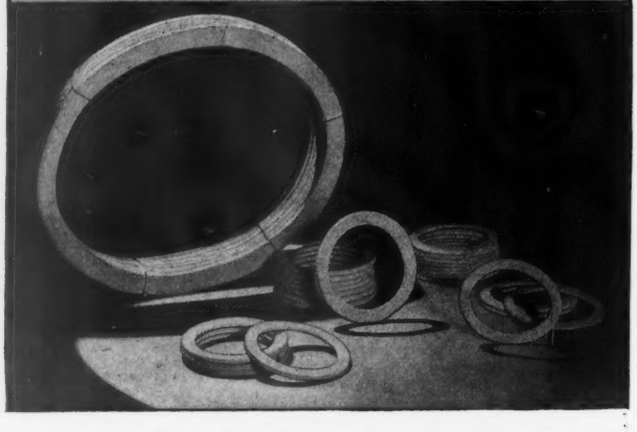

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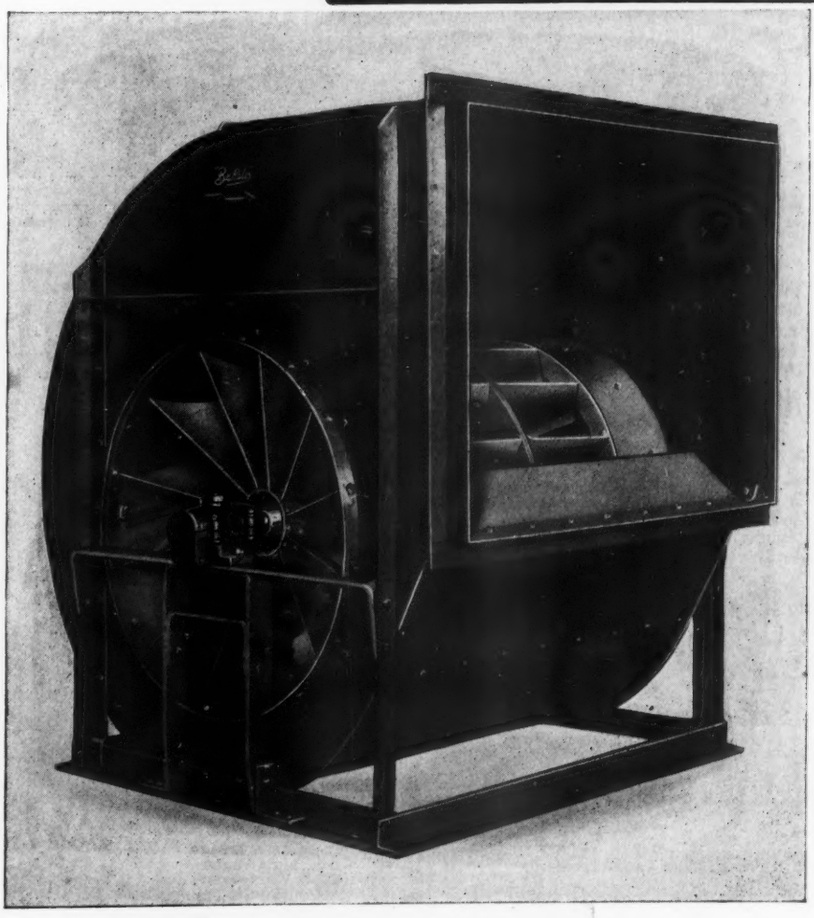

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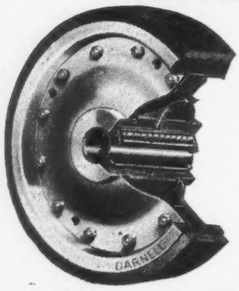

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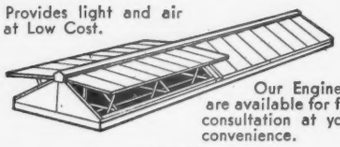

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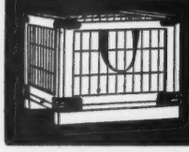

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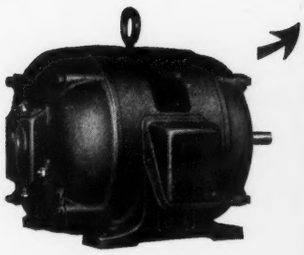

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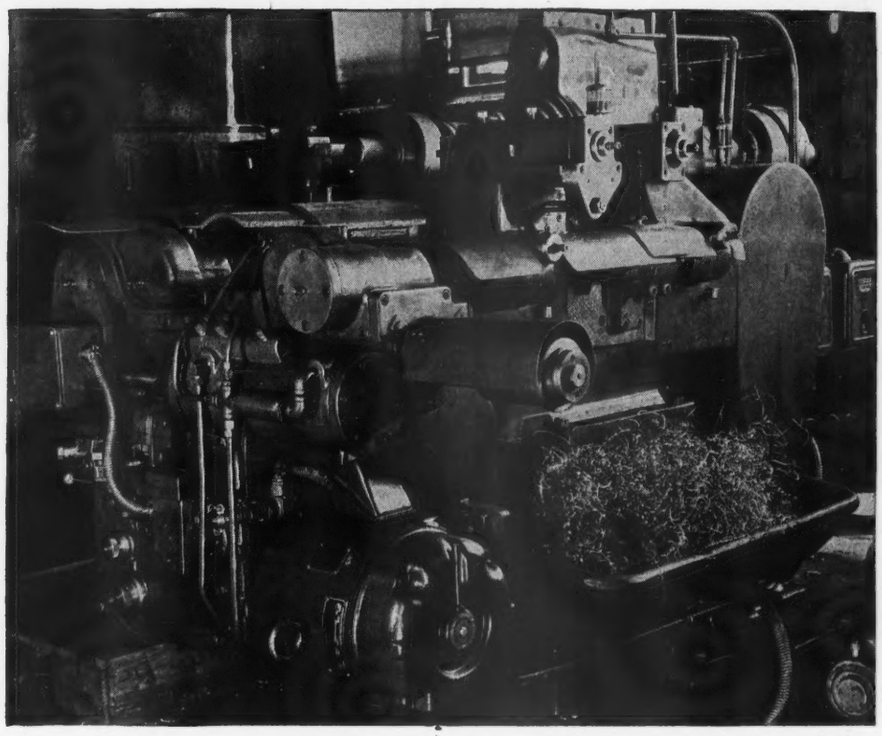

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A Complete Stock **Prompt Shipment**

SPECIAL. 2—450 KVA Pittsburgh Transformers, 3-phase 60 cycle, 12000–230/460 volts **$735.00** Each

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ALL TRANSFORMERS GUARANTEED FOR ONE YEAR
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THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI, OHIO

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Contact Us to Buy or SELL

USED EQUIPMENT

For the Factory, Power Plant, Shop, Yard or any Industrial Use

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DIESEL UNITS: two 250 KVA Alternators, with Worthington 3 cyl. Diesel Engines

DIESEL UNITS: 250 KVA, 170 KVA & 75 KVA Fairbanks Morse; style VA full diesels

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Motors and Generators, A.C. and D.C. for sale at Attractive Prices. Large stock. New and Rebuilt. All Guaranteed. *Write for Stock List and Prices.*

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FORT WAYNE, IND.

WANTED

Used Browning Type Armature Coil Winder and Spreader.

W-534, Factory Management & Maintenance
330 W. 42nd St., New York City

SALARIED POSITIONS

$2,500 to $25,000

This thoroughly organized advertising service of 29 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details.

R. W. BIXBY, INC.
276 Delward Bldg., Buffalo, N. Y.

"SEARCHLIGHT" ADVERTISING RATES

UNDISPLAYED RATE:

15 cents a word, minimum charge $3.00.
Positions Wanted (full or part-time salaried employment only), ½ the above rates, payable in advance.
Proposals, 50 cents a line an insertion.

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The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
Rates for large spaces, or yearly rates, on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

EFFECTIVE PLANT OPERATION

requires capable men trained for cost reduction and methods improvement work. The opportunities for trained Methods Engineers are increasing as industry depends more and more on motion and time study and work simplification to reduce costs and increase productivity. Write for free booklet describing how our popular home study training courses in Methods Engineering fit men for responsible positions in industry.

METHODS ENGINEERING COUNCIL
Industrial Training Division
Wood & Franklin Streets
Pittsburgh (21) Pennsylvania

Salesman Wanted

by a well equipped independent company, to sell, in conjunction with present line, gasoline and fuel oil to industrial accounts in
New York, New Jersey and Vicinity
on commission.
We will give you all the technical help you need.
ADAMS OIL CORPORATION
60 E. 42nd St., New York City VA. 6-5335

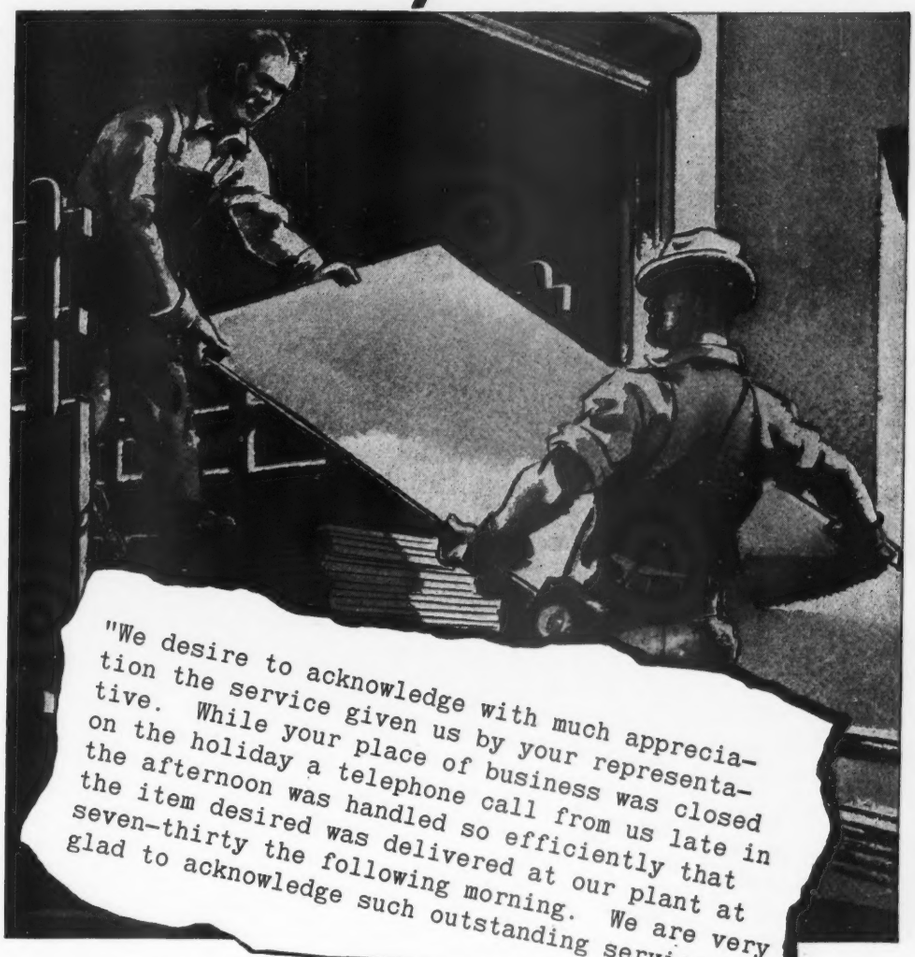
English engineering firm wishes to manufacture under license . . .

A prominent English Company welcomes the offer of any light or medium class engineering product for manufacture in the Company's own works in England under license. Write giving the fullest information regarding your product to—Box No. 123 C/o W. S. Crawford Ltd, 233, High Holborn, London, ENGLAND.

Thanks for the Kind Words... but that was regular *"Scully Service"*

ALLOYS
ANGLES, HOT ROLLED and COLD ROLLED
ARCHES (CORRUGATED)
BABBITT
BANDS and HOOPS
BARS, HOT ROLLED
ALLOYS (HR and CF)
COLD FINISHED
ELECTRIC HIGH CARBON STEEL
REINFORCING
BEAMS and C. B. SECTIONS
BEEF RAIL
BOLTS, NUTS, WASHERS, ALL KINDS
BORING and TURNING BARS and GRINDERS
BRACES, BOILER
CHAIN, ALL KINDS
CHANNELS
CHISELS
CHUCKS, STAYBOLT
CLAMPS, BOILERMAKERS
CLIPS, PATTERSON
CLEANERS, FLUE
CONDUCTOR PIPE
COPPER and BRASS
COUPLINGS, HOSE
CRAYONS, SOAPSTONE
CUTTERS
DARDELET RIVET and MACHINE BOLTS
DRILL RODS
EAVE TROUGH and FITTINGS
EXPANDERS, FLUE
FERRULES, COPPER
FLANGES, BOILER and TANK
FLOOR PLATES
GALVANIZED SHEETS, BARS, BANDS, ETC.
HANDLES, HAMMER
HEADS, TANK and FLANGE
HOISTS, HAND and POWER
IRON, STAYBOLT
LUGS, BOILER, TANK and SILO
MACHINERY, HAND and POWER
MANHEAD PLATES and FITTINGS
NAILS
PACKING
PAINT STICKS
PLATE STEEL, STANDARD QUALITIES
ABRASION RESISTING
COR-TEN and MAN-TEN
PLUGS, FLUE
RAILS and FITTINGS
REAMERS
SHAFTING
SHEETS
ABRASION RESISTING
COR-TEN and MAN-TEN
HOT ROLLED and UNIFORM BLUE
WELLSVILLE POLISHED
COLD ROLLED
STAINLESS STEEL
GALVANIZED and GALVANNEALED
LONG TERNE
CORRUGATED
U·S·S COPPER STEEL
SPRING STEEL BARS and SHEETS
STAINLESS STEEL
STRIP STEEL, CR and HR
TEES
TIRE, ROUND EDGE
TOOLS, HAND and POWER for BOILER and IRON WORK
TROLLEYS
TUBES, BOILER
TURNBUCKLES
VALVES, BLOW-OFF
WELDING ROD and WELDERS
ZEES

USS Scully Service



"We desire to acknowledge with much appreciation the service given us by your representative. While your place of business was closed on the holiday a telephone call from us late in the afternoon was handled so efficiently that the item desired was delivered at our plant at seven-thirty the following morning. We are very glad to acknowledge such outstanding service."

THIS letter from a customer in our Boston Warehouse territory is typical of many we receive. And we like to get them. But as a matter of fact there was nothing really unusual about this example of Scully Service. Prompt, friendly service is the rule on every order.

Thousands of users know that when they want steel it pays to call Scully. All eight warehouses carry a huge stock of steel, steel products, copper and brass. Each warehouse operates on the principle that customers want their materials prepared and shipped at once. And when you say, "Rush," we know you mean it.

Phone, write or wire the Scully warehouse nearest you. And ask for our handy, complete Stock List and Reference Book. It's free, of course.

SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel, Steel Products, Copper and Brass

CHICAGO · NEWARK, N. J. · ST. LOUIS · BOSTON · ST. PAUL · MINNEAPOLIS
CLEVELAND · PITTSBURGH · BALTIMORE

UNITED STATES STEEL

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NO Production LAGS

NO JOB DELAYS – NO LATE DELIVERIES

AT THE PLANT OF

Fabricators of Steel and Alloy Industrial Equipment

TANK BUILDERS
ENGINEERS
MACHINISTS
GALVANIZERS

L. O. KOVEN & BROTHER, INC.

JERSEY CITY, N. J.

Read how McCaskey Production Control has cut costs for L. O. Koven and Bro. Inc., Jersey City, N. J., as expressed by Mr. J. L. Keating, Production Manager.

"Our McCaskey Production Control now has been in use since late in 1937. It gives us accurate information assuring deliveries on schedule without a volume of burdensome detail. The even flow of work in our various departments, that has resulted, also has cut costs in several ways.

"No job can lag while others are shunted ahead. We know at all times how much work each department is capable of absorbing without delays. Complete data for every order in process, including material deliveries, work done in each department and the date of movement to each successive operation from beginning to shipment are available at a glance.

"The assembly of approximately two hundred complicated orders per week is followed through a maximum of twelve departments by only one production tracer. The Planning and Plant Offices are quite a distance apart and dual controls are maintained without a single additional entry, providing the Planning Department with current information concerning activities in the plant at all times."

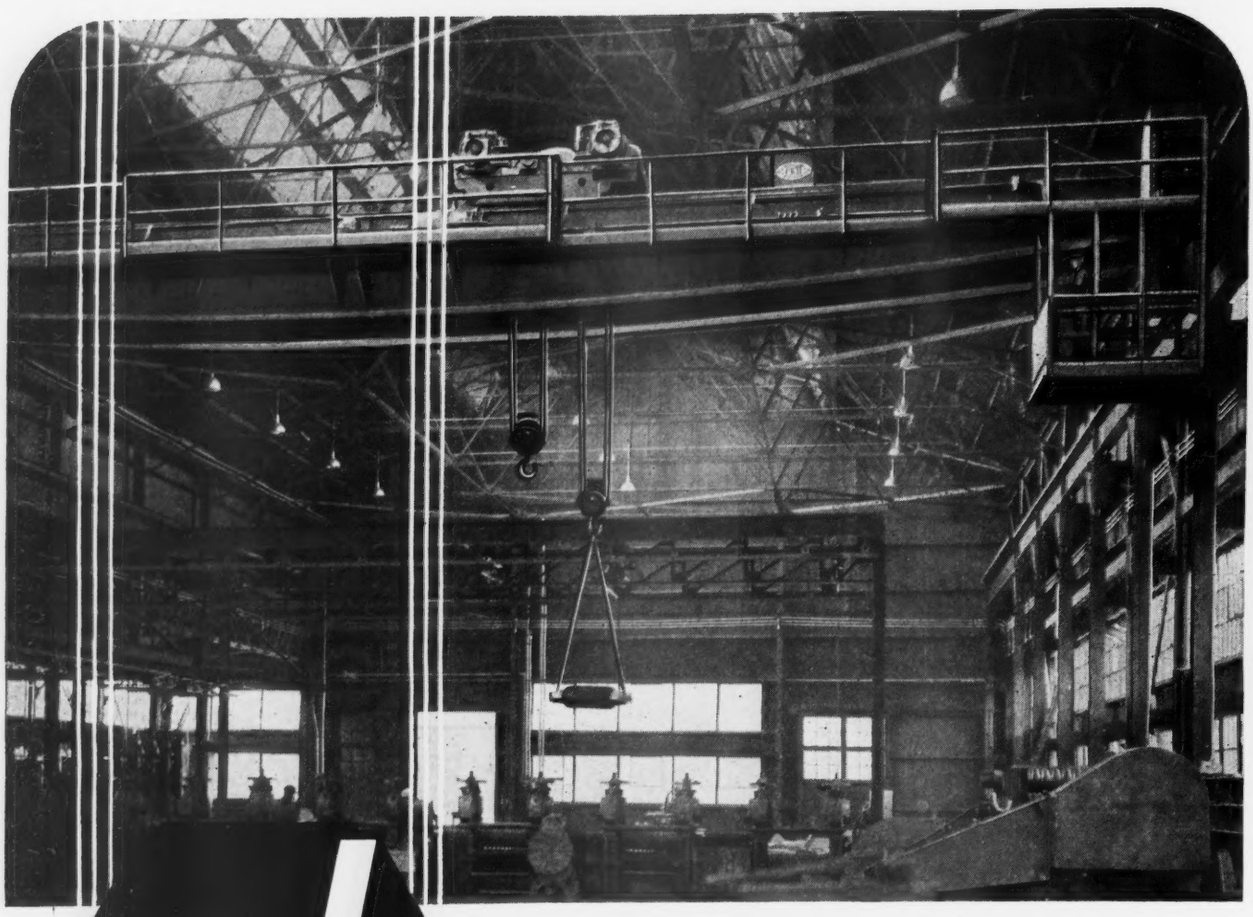
Jacketed Nickel Kettle

A.S.M.E. Constructed High Pressure Auto Clave

Controls are based on fundamentals adaptable to varying production requirements. A qualified representative will gladly talk to you about the application to your specific needs and the savings that may be made in your plant. Or, let us send you "Simplified Production Control", or pamphlets describing other McCaskey Industrial Controls. The McCaskey Register Company, Alliance, Ohio.

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL



p&h

ELECTRIC CRANES

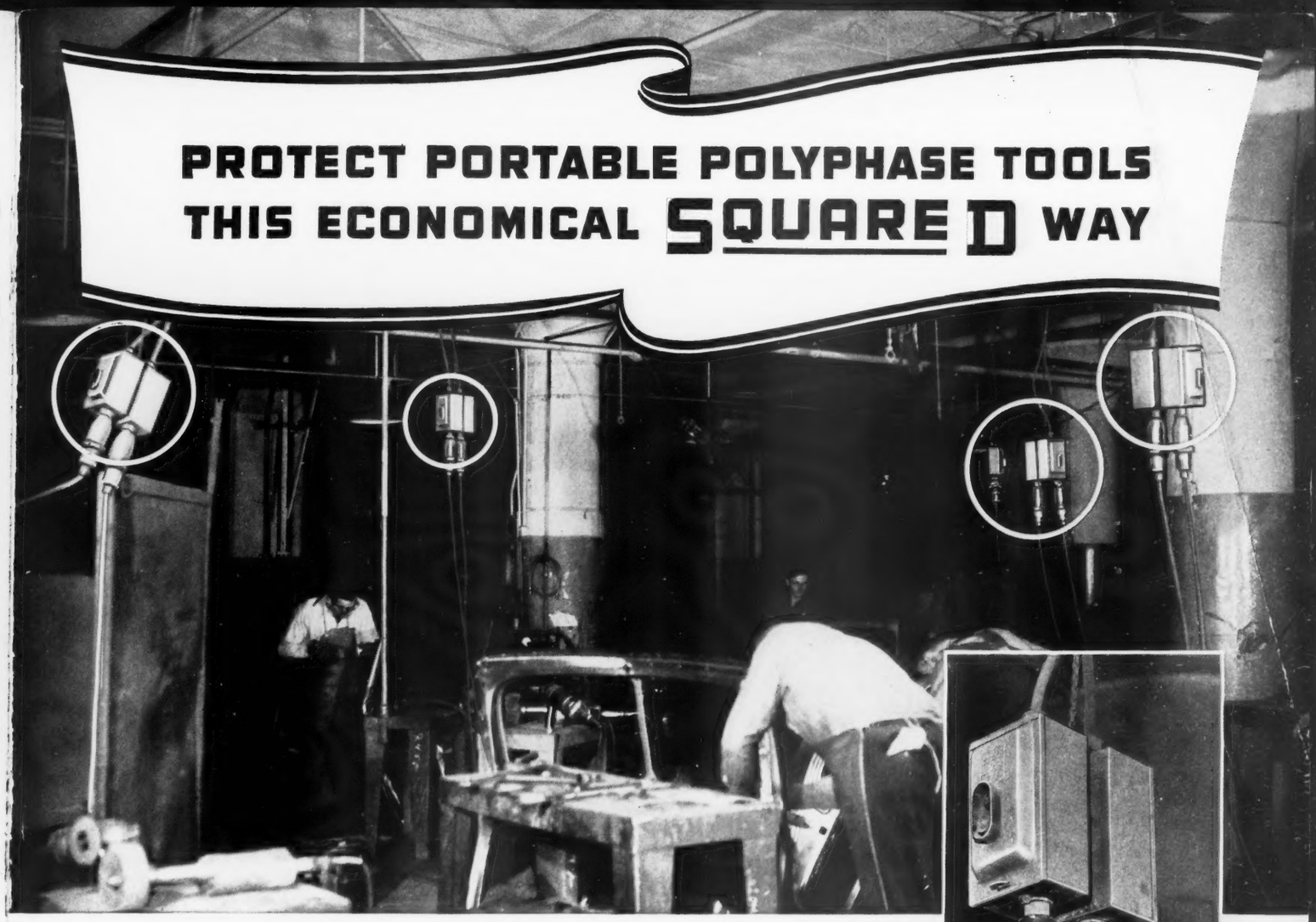
You may be sure that your material-handling equipment, built by this group of specialists, will solve your problems in the most efficient manner. The experience of over 50 years . . . of building more than 10,000 cranes . . . is at your disposal through America's largest builder of overhead handling equipment. Harnischfeger Corporation, 4525 West National Avenue, Milwaukee, Wis.

ALL CAPACITIES FROM 5 TO 300 TONS

HARNISCHFEGER CORPORATION

ELECTRIC CRANES • EXCAVATORS • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

PROTECT PORTABLE POLYPHASE TOOLS THIS ECONOMICAL SQUARE D WAY



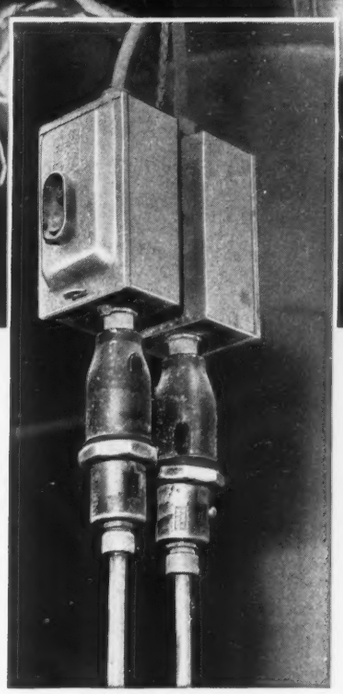
One corner of an automotive plant—four twin groups of Class 2510 Square D starters. These have served faithfully for six years.

● Here is a practical, economical way to protect your portable electric tools against motor burnouts.

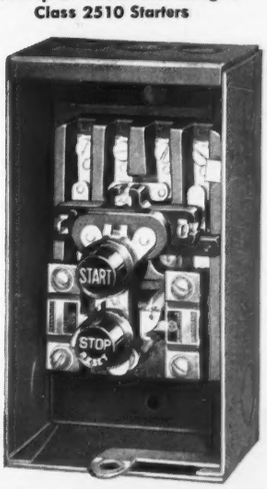
Exhaustive tests in the world's best proving ground — the automotive plants of the Detroit area — have shown that 75% of all trouble with polyphase portable tools is due to single phasing caused by broken cords or defective switch contacts. It has been further demonstrated that the enclosed motors of portable tools reached a burnout temperature very quickly under single phase operation.

A simple remedy was found in the Square D, Class 2510 manual polyphase starter. It has a thermal overload relay in each phase of the circuit and the thermal units can be selected to protect the motor against excessive single phase currents.

These starters are small, light weight, and inexpensive. They can be mounted as shown in the illustrations. Many years' experience has shown that they soon pay for themselves by greatly reducing motor burnouts and consequent shut-downs.



Close-up of double mounting of Class 2510 Starters



Open view of Class 2510 Starter showing thermal relays

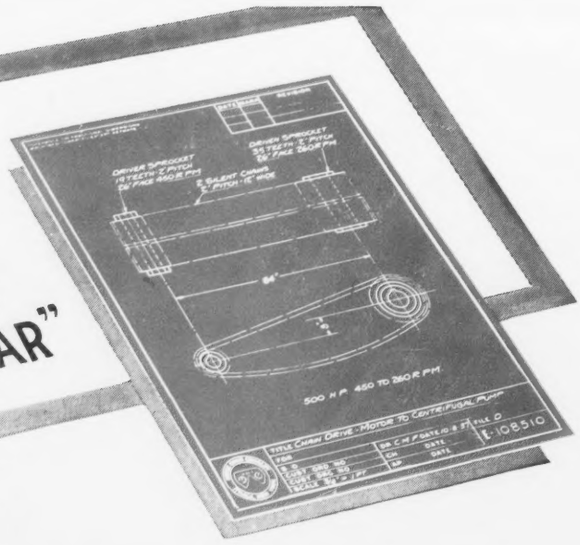
CALL IN A SQUARE D MAN

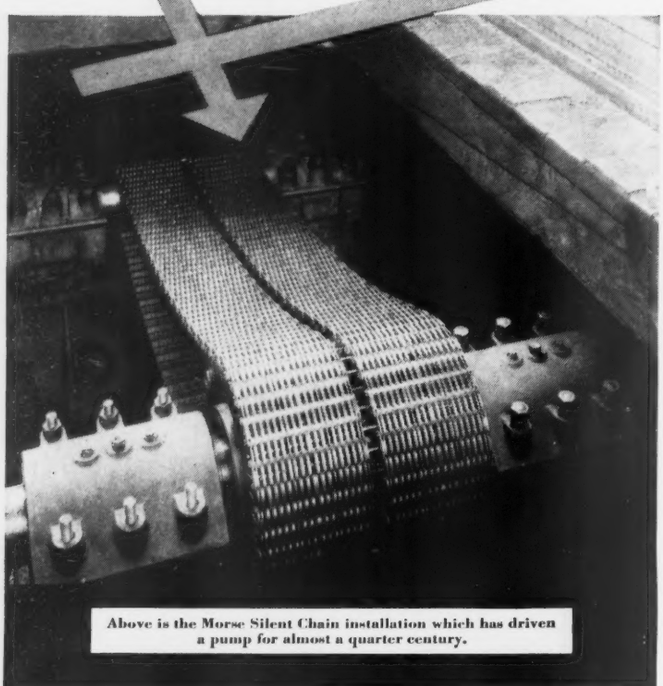
SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

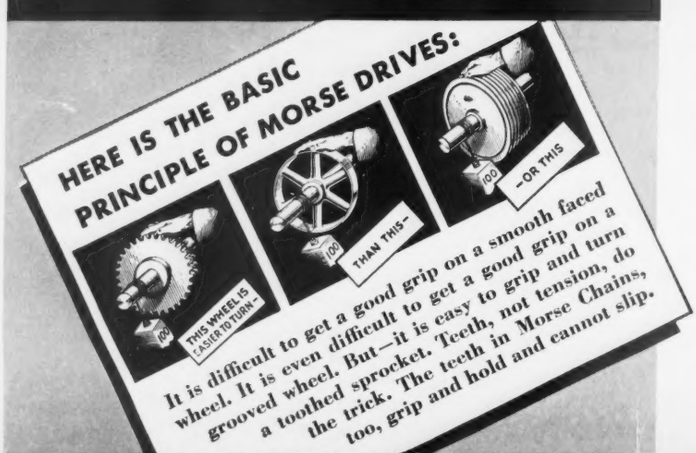
IN CANADA: SQUARE D COMPANY CANADA, LIMITED, TORONTO, ONTARIO

THIS MORSE SILENT CHAIN, 23 YEARS OLD, is now beginning to show a LITTLE WEAR"





Above is the Morse Silent Chain installation which has driven a pump for almost a quarter century.


HERE IS THE BASIC PRINCIPLE OF MORSE DRIVES:
THIS WHEEL IS EASIER TO TURN—
THAN THIS—
—OR THIS
It is difficult to get a good grip on a smooth faced wheel. It is even difficult to get a good grip on a grooved wheel. But—it is easy to grip and turn a toothed sprocket. Teeth, not tension, do the trick. The teeth in Morse Chains, too, grip and hold and cannot slip.

Economical, Efficient, Power Transmission with MORSE *TROUBLE FREE* SILENT CHAINS

Away back in 1915—twenty-three years ago—a Morse Silent Chain driven pump was installed for an upstate New York plant. Just the other day came a letter from the pump manufacturer asking for quotations on repinning the drive. It seems that the chain is "now beginning to show a little wear."

Well, even a Morse Silent Chain can't last forever! Morse Silent Chains have always been great performers, constantly improved year after year and delivering power smoothly, surely, with efficiencies up to 99.4%. The multiple teeth of the chain acting upon the sprockets reduce wear to an absolute minimum, lubrication is no task at all, and service and maintenance stops are few and far between.

In hard driving jobs and easy ones, Morse drives turn the wheels without slipping or faltering. Production levels rise to new highs, power costs are shaved because of greater drive efficiency, maintenance costs are lowered through the sturdy, trouble-free construction of these better drives.

There's a Morse Silent Chain for practically every power transmission job. Pitches from ⅛" to 3", capacities from fractional to thousands of horsepower.

Ask the Morse man in your territory about Morse Silent Chains. Or write Morse, Ithaca.

SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS KELPO CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY, ITHACA, N. Y. • DIVISION BORG-WARNER CORP.